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Making a Punch Press Department Safe

How a Manufacturing Company Has Greatly Reduced Accidents—Securing the Necessary Co-operation—Methods and Devices That Helped Make for Safety

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A POWER press is among the most dangerous tools to operate, so that a press department may be considered as having one of the greatest accident hazards in the average manufacturing plant.

An exception to this general statement is to be found in the works of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., where the safeguarding of the press department has been systematically studied and developed. All safety work is under the direction of the manager of the employees' service department, reporting to the vice-president in charge of engineering and operations. A supervisor of safety appliances has, however, immediate charge of the details of operation and routine.

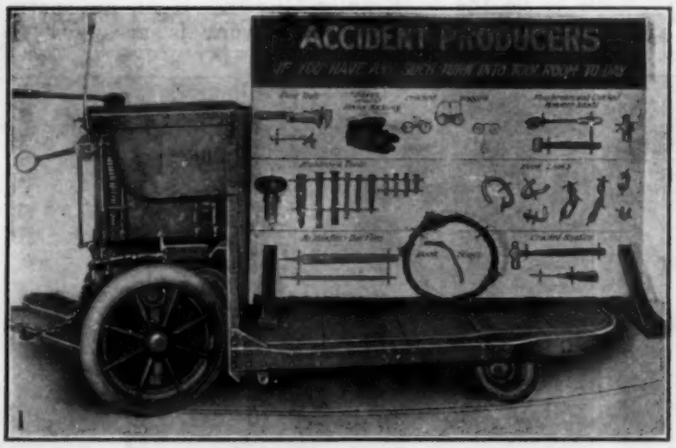

FIG. 1. EXHIBIT OF ACCIDENT PRODUCERS.

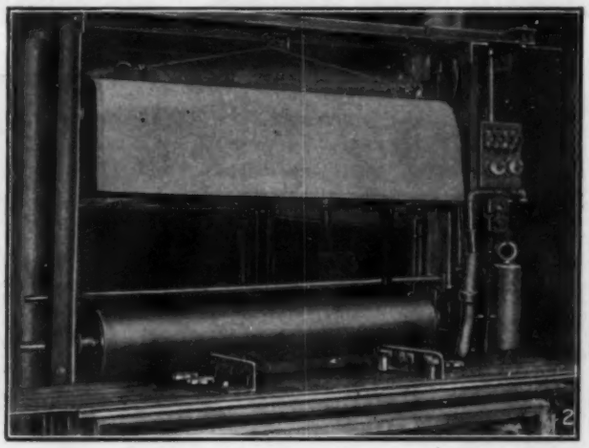

FIG. 2. FIRE HOOD FOR ENAMELING ROLLS

In the purchase of new tools and equipment, preference is given, other things being equal, to those best guarded; further, when a tool is taken out for repairs, it is guarded if need is shown, before being put back on production.

To assist in keeping every one on the mark, a safety patrol of about fifty members has been organized, most of whom are workmen. Their duty is to patrol their departments one of more times weekly, in order to see that the workers are handling themselves and their tools properly, that gloves are not worn when gloves would be dangerous, that goggles are worn when their non-use would be a hazard, that guards are being used or are not removed, that fire plugs and lights are not covered or blocked by material, etc. Should any infraction of rules be observed by them, the matter is usually reported to the foreman of the department involved. For their service in this safety work, they are paid at their average earned hourly rate.

Meetings of the safety patrol are scheduled at intervals, at which safety matters are discussed by the members and by various of the works personnel as well as by outside experts. In addition, meetings of the department superintendents and their staffs are held from time to time when actual accidents in their departments are reviewed and ways and means discussed to prevent any recurrence. Occasional meetings of the rank and file of the workers likewise take place.

Thermometer charts are posted throughout all departments so that employees may see the record of their individual departments, the average number of accidents per month for the preceding year as well as the accidents each month for the current year, being given.

Bulletin boards as well as the shop magazine are also utilized to convey information to the employees; but, even they do not fully cover "safety advertising" requirements, so a traveling bulletin board or exhibit has been constructed, on both sides of which are shown actual "accident producers." This exhibit, Fig. 1, is mounted on an electric battery truck, travels slowly up one aisle and down the other, in and out of buildings, reaching the various floors by means of elevators, until practically all employees have had their attention drawn to some of the things that cause accidents.

It is being more and more generally recognized that the mechanical guarding of tools, does not constitute the solution of the problem of accident prevention in the industries, and is but one of a number of considerations entering into this work. Among other items requiring solution as a part of this problem may be mentioned: Labor turnover; good health; cleanliness and neatness (personal and plant); good lighting; pro-

hibition; education (English language at least); carefulness. In carrying out this program in part at least, the press department is kept scrupulously neat and clean; and the aisles are regularly maintained. Excellent lighting, both natural and artificial, has also been provided, the latter consisting of general illumination as well as

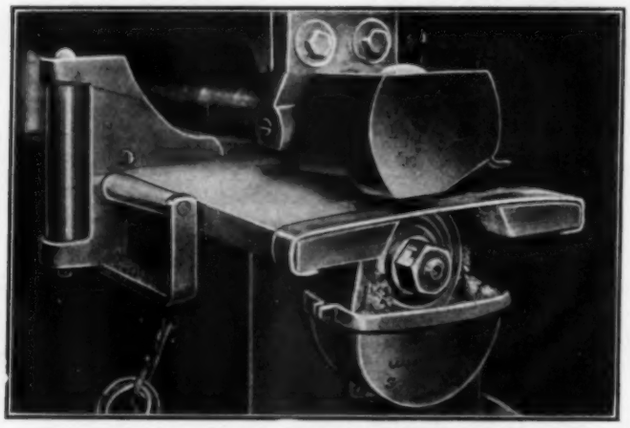

FIG. 3. GUARD FOR ROTARY SHEARS

cleats are placed on the floors at corners and along the sides at a suitable distance from the piles, so that passing workmen will not come in contact with sharp edges.

Much of the material used is enameled, some of it in sheets before punching, and where this is the case a device which might be called a box tongs has been constructed, to insure the safe handling of the finished product. In the enameling process, there is a fire hazard since the enamel which is baked on, is of an inflammable material. A very effective hood, Fig. 2, has been provided to smother any fire starting from this cause, the hood being simply lowered over the enameling rolls through which the sheets pass, after which a hand fire extinguisher is quickly turned into the hood.

In cutting the sheets, danger from injury is provided against by simple guards shown in Figs. 3 and 4, the first for slitting shears, the second for the squaring shears.

In the actual punching of material, every effort is made to do the work automatically. If an automatic operation is not feasible, the work is arranged to

FIG. 4. GUARD FOR SQUARING SHEARS. FIG. 5. USING A SUCKER

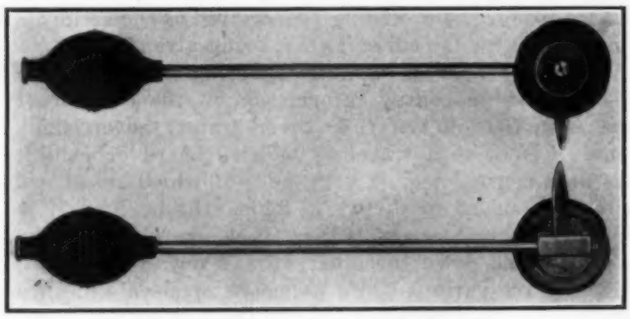

FIG. 6. AN IMPROVED SUCKER

individual lights at the tool where needed. The number of sizes and grades of sheet metal used are kept at an absolute minimum and arrangements have been made with the suppliers to ship on wooden skids.

In this way the band irons formerly used for tying the material into bundles, have been dispensed with, and unloading, transporting and piling have been greatly simplified. Protective corners, too, boards, or

avoid the necessity of the hands of the operator being placed at any time within the danger zone. Punch presses will almost certainly repeat sooner or later, and bolts, nuts, etc., will become loose, so that any guard which is depended upon to throw the operator's hand out of the danger zone as the press goes into action, is not so reliable as a guard or device which requires the hand to be moved to a safe position before the operation commences.

A unique device for feeding small approximately flat material both into and out of a press is shown in use in Fig. 5. It is a hand sucker (operated by means of a suction pump) which is placed on top of the material, a valve in the handle being opened by pressure of the thumb on a button and the sheet then lifted either into or out of the press. The sheet is released by removing the pressure on the button. This device is also made with two or more suckers at different levels attached to the same handle, for use with punchings of more or less irregular shape. A recent improvement, Fig. 6, has eliminated the necessity for the pump, the suction being secured by squeezing a bulb in the handle

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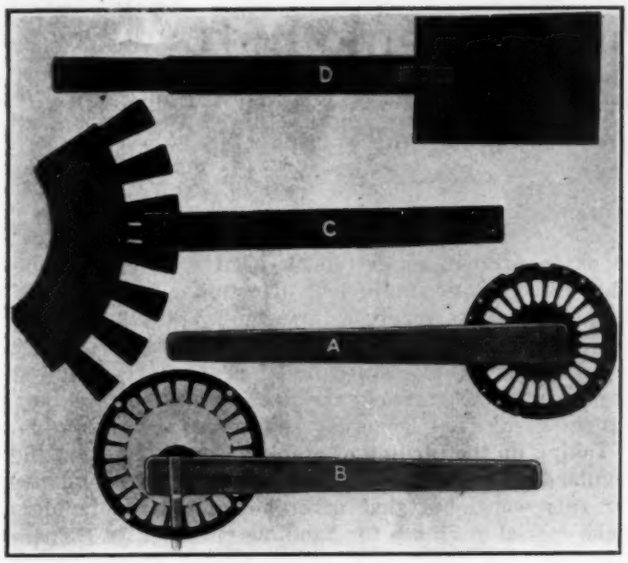


FIG. 7. LIFTERS FOR SMALL WORK

and the release obtained by squeezing the bulb again.

Simpler devices are shown in Fig. 7 but they have a more limited range of application. *A* and *B* are of wood, *C* and *D* of metal; the former being provided with felt swabs at the working end which are used for lubricating the dies. The hairiness of the felt enables the punching to be lightly gripped and swept out from under the punch. Should an occasional punching stick, it can be readily loosened by means of the metal finger. Magnetic lifters and special pliers are also used.

A suction device has been developed to apply to the drawing into the press of long heavy sheets. The sucker runs back and forth on a monorail at the rear of the press and is controlled by two parallel rods extending through to the front, one on each side. The handles are gripped by the operator and pushed to the rear until the sucker comes directly over and rests upon the top sheet of the pile of material. When the valve is opened the sucker grips the top sheet which is pulled into position in the press. Closing the valve releases the sucker from the sheet.

In Fig. 8 is shown a battery of presses and illustrates the type of guard used for flywheels. These guards are provided with hinged doors so that no difficulty is encountered in getting at the interior when necessary.

In Fig. 9 is shown a press equipped with an interlocking safety trip compelling the use of both hands. A seat is attached to the frame of the press and can be readily raised or lowered to suit the height of the operator. When not occupied, it can be swung around to the side of the press.

The removal of scrap is at all times an awkward matter, but has been rather simplified by having it gathered from each press before any considerable accumulation occurs and placed in metal cointainers. These containers are then taken to a baling press, and the scrap baled into approximately 190-lb. cakes. The containers are provided with hinged sides and bottoms so that their contents are easily unloaded.

The work of safety is one that should be participated in by everybody, individually and collectively, by em-

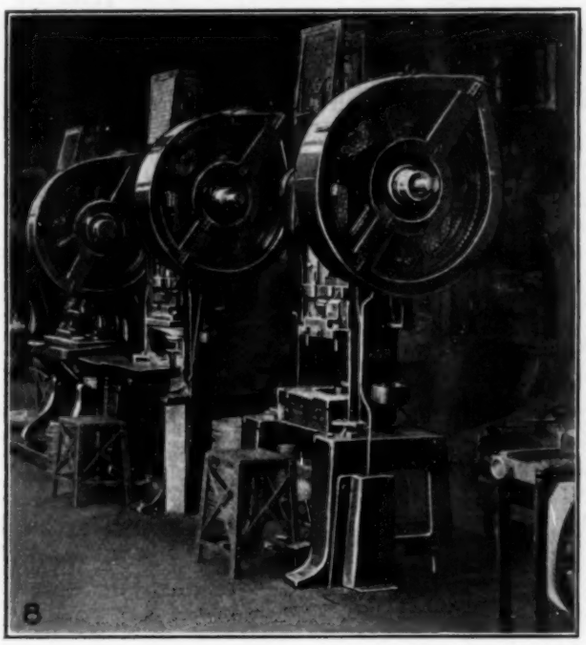


FIG. 8. FLYWHEEL GUARDS. FIG. 9. PRESS WITH INTERLOCKING SAFETY TRIP

ployers and employees, by the public, by organized bodies and by the Government; it cannot be carried on by any one group alone, if the most headway is to be made.

The necessity for this co-operation is quite evident when the statement is made that the industries are becoming even safer than the homes and the highways. Of 80,000 fatal accidents happening annually in the United States, approximately 22,000 occur in the industries and 58,000 in the homes, on the streets and along the highways. The knowledge gained by anyone along this line, should be placed at the disposal of the general public, so that the greatest good will result to the greatest number and the sum total of human suffering be the more quickly minimized.

As a contribution to this end, the Westinghouse Electric and Manufacturing Co. will gladly supply, without charge, working drawings, photographs, or other information about the guards in use in its plant.

Machining Automobile Crankshafts

Approved Methods of Machining and Balancing Crankshafts—Data as to Wheels for Various Grades of Steels—Wheel Speed and Wear

By FRED H. COLVIN
Editor, American Machinist

THE machining of automobile crankshafts may be divided into comparatively few kinds of operations, although the number of handlings are often more than might be imagined. Roughly speaking, they may be classed as centering, rough-turning,

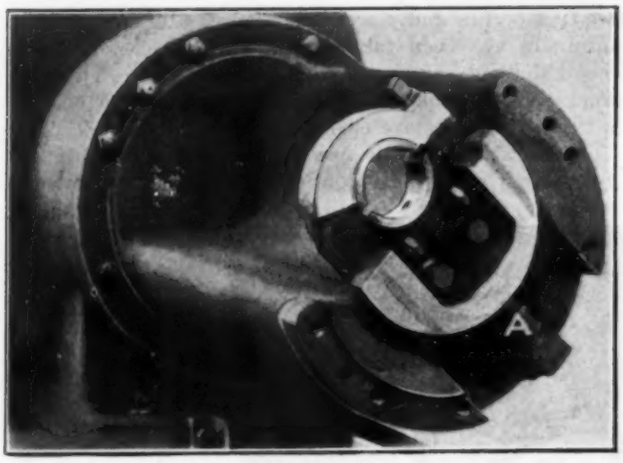


FIG. 1. CHUCK FOR CRANKSHAFT LATHE

heat-treating, grinding, drilling for pressure oil-feed and in some cases milling the cheeks or webs.

In a few instances, the crankpin bearings are ground from the rough forgings, but this is not customary. Occasionally the main bearings are also ground from the rough after the center bearing has been spotted or rough-turned for a steadyrest support. The usual method, however, is to rough-turn all the bearings, both main and crankpin and then finish on the grinding machine, generally dividing the grinding into a number of operations. These grinding operations are frequently sandwiched in between other operations, such as drilling, milling the cheeks, etc., in order to remove any distortion due to springing of the crankshaft by the various operations.

There is an increasing tendency toward pressure feed for lubrication, which means drilled crankpins and main bearings. The oil connection between the two is usually secured by drilling down through the crankshaft cheeks, while in some designs this connection is made by a small copper tube on the outside.

The method of oiling depends on whether the oil is pumped through the crankshaft to the bearings, or whether it is pumped to the main bearings and flows from here through holes in the bearings and oils all connections from the main bearings to the crankpins. In either case, there is an increasing tendency to give a definite allowance for the oil film, usually about 0.015 in., which effectively separates the bearing surfaces and at the same time insures the oil being forced to the crankpins.

There is a tendency in some quarters to abandon alloy steel for crankshafts and use low carbon steel which has been carburized very deeply and hardened so as to present an extremely hard wearing surface. This is bound to secure long life to the bearings and at the same time secure a very tough crankshaft. Unless used with bearings between each crank, such as seven bearings on a six cylinder crankshaft, it might be necessary to increase the diameter to some extent, but the results are, generally speaking, very gratifying.

Taking up the turning of crankshafts we find that the regular engine lathe has been practically abandoned for this work, but that several engine lathe builders make special machines for handling crankshafts. These machines are practically double-headed engine lathes equipped with special chucks so as to clamp the shaft easily and quickly. It is customary to locate from the main bearing and to clamp and drive by the web of the crank. The chucks have adjustments so that the shaft can be moved to give the correct throw to the crankpin. A detail of such a chuck is shown in Fig. 1,

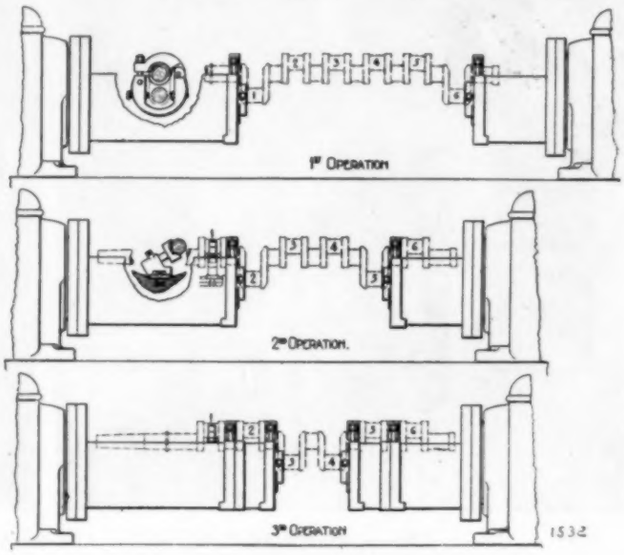
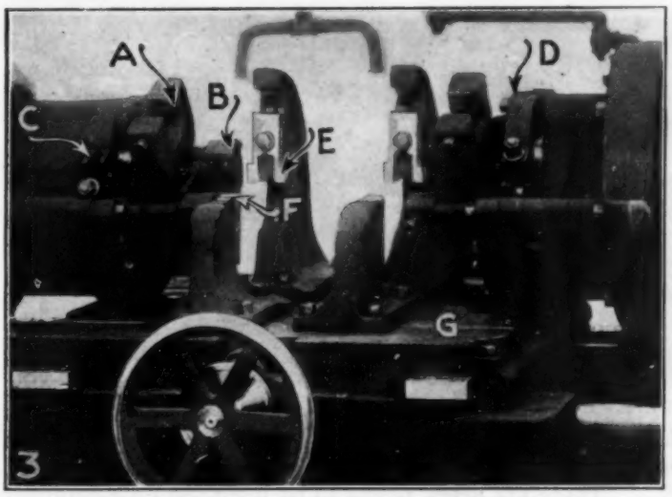


FIG. 2. DIAGRAM OF OPERATIONS

where *A* is a spacing block used to secure the proper throw of the crank.

The outline drawing shown in Fig. 2, shows how the work is planned to always have the cut next to the chuck where it will be supported against springing. Pins Nos. 1 and 6 are turned in the first operation. The heads are then moved toward each other and pins Nos. 2 and 5 are next turned. The third operation turns pins Nos. 3 and 4, the crankshaft being supported in each case by the chuck jaws which grip the crank web beside the pin being turned.

The arrangement of the chuck jaws *A* and *B*, the clamps *C* and *D* and the cutting tools *E* and *F* are shown in Fig. 3. The tool *E* faces down the sides of the crank webs while *F* rough-turns the pins. This illustration shows how the tools are mounted on the flat carriage *G* which has a crossfeed movement only. Lengthwise adjustment, for positioning only, is secured



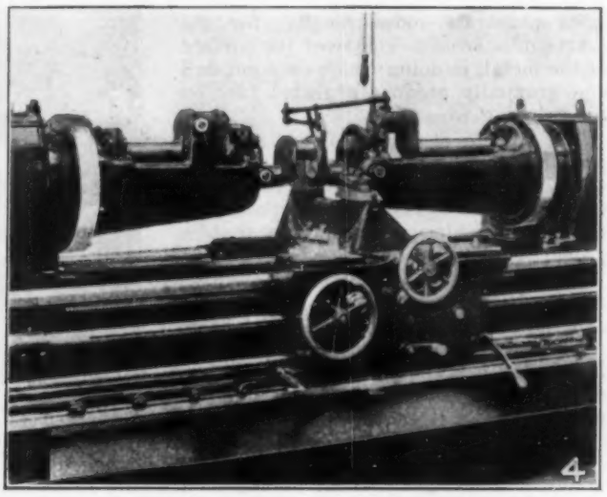


FIG. 3. TOOLS AND CHUCKS IN CRANKSHAFT LATHE. FIG. 4. TURNING A TRACTOR CRANKSHAFT

by the rack shown. Fig. 4 shows a Holt caterpillar crankshaft in place. Both Figs. 3 and 4 show the Lodge & Shipley method of handling crankshaft work. As before stated, somewhat similar machines for this purpose are built by other engine lathe builders.

A somewhat different method of machining crankshafts may perhaps best be distinguished as the multiple-tool method, citing the Lo-Swing lathe as an example of this class. A layout of the tools used in such cases is shown in Fig. 5. This illustration, however, does not show the pin and bearing turning tools, but only the tools for squaring up the crank webs and turning the end of the shaft with its various diameters, shoulders and taper.

The sequence of operations is as follows:

First Operation—	
1. Turn H, G, F 2. Rough square 3. Finish square	Time—12 min.
Second Operation—	
1. Turn A, B, C 2. Turn D and E 3. Neck	Time—10 min.
Total time	22 min.

Further details concerning methods of machining in the lathe will be shown in later articles, from the practice used in making the Peerless and the Rolls-Royce crankshafts.

The details of grinding which follow are largely due to the courtesy of the Norton Company.

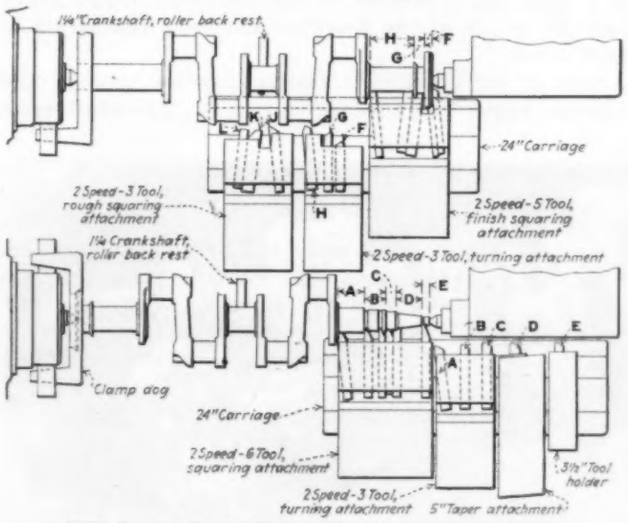


FIG. 5. TOOL LAYOUT ON LO-SWING LATHE

Several factors affect the successful grinding of crankshafts, the material itself being one of the main considerations in the selection of the proper grinding

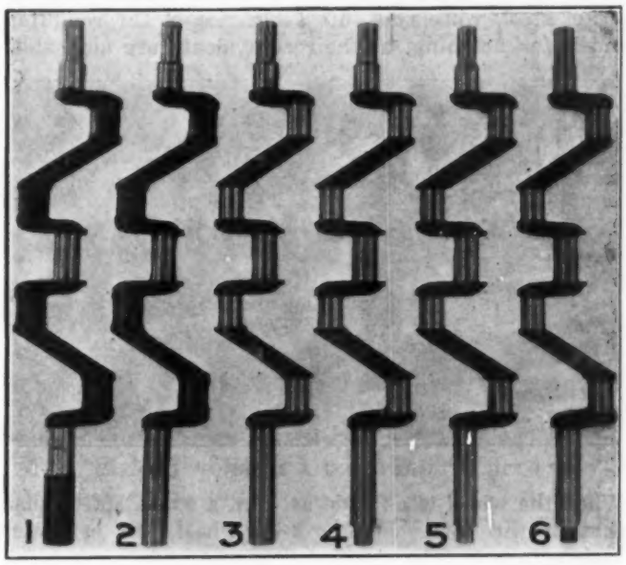


FIG. 6. OPERATIONS ON AN ALL-GROUND CRANK

wheel. For grinding a high tensile strength steel an aluminous abrasive is recommended while a carbide of silicon wheel is suggested for low tensile steel. It is the physical and not the chemical properties of the wheel which are to be considered. The following quotations from W. T. Montague are of interest:

The two physical properties which affect abrasive action most are:

Resistance to penetration. In order to remove a chip, the abrasive must first penetrate the metal being ground.

Tensile strength of the material. The abrasive must stand up to the cut while being forced through the metal.

High reistance to penetration and high tensile strength do not necessarily go together. These two conclusions may be drawn regarding the grinding of materials of high resistance to penetration.

The greater the resistance to penetration, the more brittle should be the abrasive. An abrasive of brittle temper usually fractures with sharper points and cutting edges than a tougher abrasive, hence there is a better opportunity for it to penetrate a hard dense surface.

The greater the resistance to penetration the finer should be the grain of the abrasive. On hard materials the fine

grits penetrate more readily, for the coarse ones seem to ride over the surface of the metal, in doing which they get dull and gradually produce a glazed face on the grinding wheel.

The tensile strength of the material probably exerts a considerably greater effect on grinding action than resistance to penetration. The metal opposes the removal of chips with a force that is proportional to its tensile strength.

The higher the tensile strength of the metal, the harder it is to remove a chip and the tougher the abrasive must be to prevent fracture while the grain is making the cut. Alundum, the tougher abrasive, is the type to use for grinding steel of high tensile strength.

Crystolon is the correct type for material of low tensile strength. In such materials the brittle crystolon grain is able to cut through without breaking off before it has done its work. Low tensile strength materials offer enough resistance to keep the wheel sharp.

The wheels recommended for roughing carbon steel crankshafts (30 to 45 points) are grain 36, Grade O, alundum; for finishing, grain 24 combination, grade M is recommended. For harder materials, such as nickel steel, wheels as soft as grades N for roughing and L for finishing, or their equivalents are advisable.

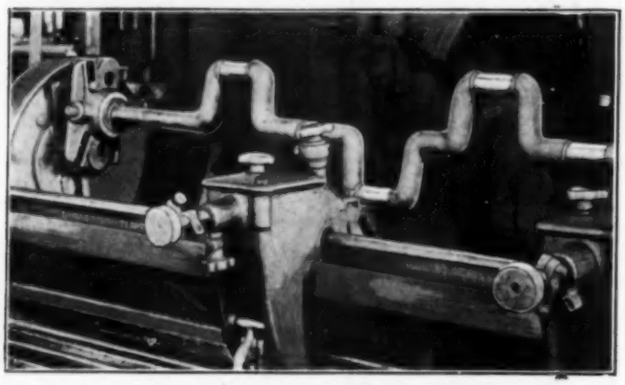


FIG. 7. GRINDING A 3-THROW CRANK

When the wheel is as wide as 4 in. a grade softer than that of the corresponding 2-in. wheel will be found satisfactory.

An "all-ground" crankshaft is shown in its different stages in Fig. 6. The sequence of operations can be easily followed without further description. Fig. 7, shows an unusual crankshaft for agricultural machinery. It has three throws and a central bearing but is not for motor work.

Two tables showing the grinding equipment necessary to secure a desired production may be of service either in equipping a new department or in checking up present performance. Table I is for a small production, 15 four-throw crankshafts per hour, while Table II is for a production of 80 per hour. The stock removed is approximately the same in both cases. Table I is an estimate. Table II is the result of actual production.

A little data on grinding wheel performance is given in Table III. This shows the exact number of crankpins ground, the life of the wheel, the frequency of wheel dressing, the amount of wheel wear, etc. As with the other tables, the figures are of value in checking up your own practice.

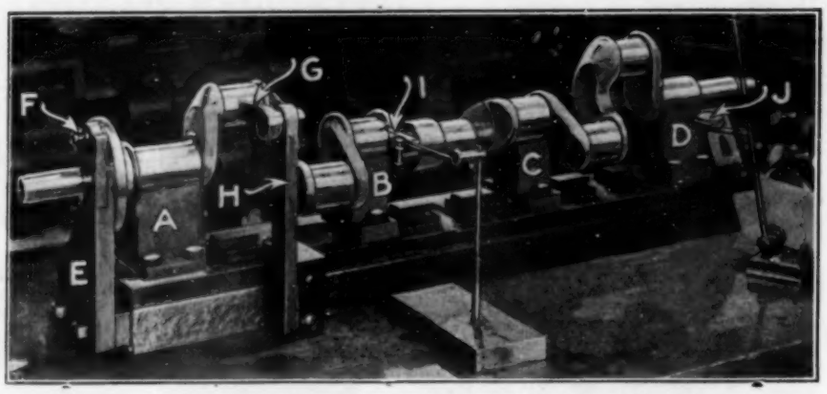


FIG. 8. INSPECTING STUDEBAKER CRANKSHAFT

There are many points to be inspected on a carefully made crankshaft and many methods used in the final inspection. Fig. 8 shows the method used in the Detroit plant of the Studebaker Co. The shaft has four bearings which are supported by the blocks *A*, *B*, *C* and *D*. The upright *E* is cut away at the top to clear the straight end of the shaft and carries an index pin at *F*, which holds the crankshaft in the three positions necessary to test each pair of crankpins. As shown, Nos. 1 and 6 are in position for testing.

TABLE I. APPROXIMATE GRINDING EQUIPMENT NECESSARY FOR PRODUCING FIFTEEN FOUR-THROW CRANKSHAFTS AN HOUR

No. of Machines	Size	Operation	Stock Removed In.	Hourly Prod.
1	10x50 in. regular	Rough 2 end bearings	0.020	15
1	16x36 in. double head pin machine	Rough pins Nos. 1 and 4.	0.020	15
1	16x36 in. double head pin machine	Rough pins Nos. 2 and 3.	0.020	15
1	16x36 in. double head pin machine	Finish pins Nos. 1 and 4.	0.020	15
1	16x36 in. double head pin machine	Finish pins Nos. 2 and 3.	0.020	15
3	10x50 in. regular	Rough and finish grind center bearing and finish, two end bearings.	0.020	15
1	10x50 in. regular	Finish grind, gear fit and pilot, outside flange	0.020	20

The correctness of the throw angle is tested by the arm *G* which swings on the upright *H*, positioned for each pair of throws in turn. Indicator *I* tests the truth of the shoulders of each main bearing, a multiplying lever showing minute deviations. The dial indicator at *J* tests the roundness of the bearings. Other gages test the length of the bearings and their realization to each other.

One of the crankshaft testing fixtures used by the Lincoln Motor Co. is shown in Fig. 9. The shaft rests

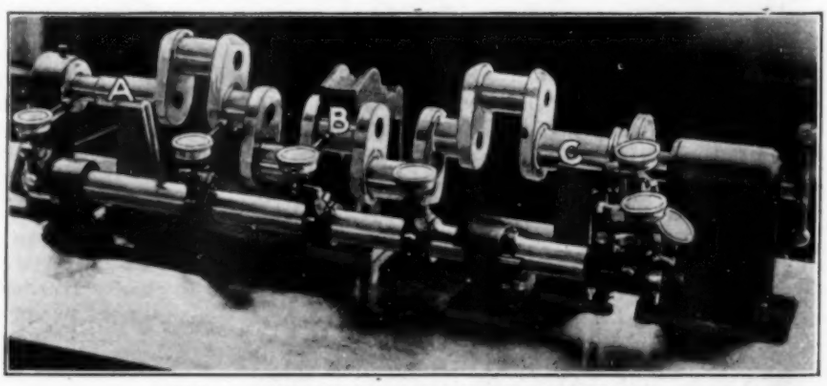


FIG. 9. INSPECTING LINCOLN CRANKSHAFT

on three bearings *A*, *B* and *C* and is held endwise by a spring tension plunger. The lower bearing *B*, is a post set in a fixed position, but capable of adjustment for wear. The upper half is hinged.

The center bearing must show within 0.003 in. total indicator reading when resting on the end supports. It must show within 0.001 in. total indicator reading on the bearing each side of the center when the center bearing is clamped down. This fixture also indicates the flywheel pilot for concentricity and the flange for

TABLE II. CRANKSHAFT PRODUCTION REQUIRED 80 PER HOUR

Operation No.	Description of Operation	Name of Machine	Capacity One Machine Nine Hours	Machines Required
1	Rough grind center bearing for steadyrest	Norton Gr. 10x36	400	2
2	Face web on No. 3 line bearing	17 in. Wickes lathe	400	2
3	Turn and straddle side of center bearing, leaving 0.030 in. for grinding			
4	Turn rear bearing, leaving 0.030 in. for grinding	21 in. x 8 ft. LeBlond and 17 in. x 6 ft. Wickes lathes	400	2
5	Straighten	Straightening press	500	2
6	Semi-finish grind center bearing	10x50 in. Norton grind	275	3
7	Face rear bearing to length	17 in. x 8 ft. LeBlond.	400	2
8	Straddle face flange	LeBlond lathes	300	3
9	Turn flange and space, No. 1 bearing	17 in. LeBlond or Wickes.	300	3
10	Turn grooves at flange	17 in. LeBlond or Wickes.	275	3
11	Rough turn 1.625 in.-1.375 in. and 0.999 in. diameters	17 in. x 8 ft. LeBlond or Wickes	275	3
12	Form oil slinger and turn 2½ dia. on flange	17 in. x 6 ft. LeBlond.	600	2
13	Neck 1.375 in. and 0.999 in. diameters for grinding	17 in. x 6 ft. Reed lathe	500	2
14	Cut off and recenter	16 in. x 6 ft. Reed lathe	600	2
15	Recenter flange end for grinding	Allen drill press	1,800	1
16	Finish turn 1.375 in. and 0.999 in	17 in. x 8 ft. LeBlond.	425	2
17	Semi-finish grind Nos. 1 and 3	10x50 in. Norton grinds	250	3
18	Rough turn 4 pins	26 in. x 10 ft. LeBlond crank pin lathes	100	8
19	Drill 6 holes in flange	Rockford drill pr	225	4
20	Rough grind Nos. 2 and 3 pins	Landis 16x32 in	200	
21	Rough grind Nos. 1 and 4 pins	Landis 16x32 in	200	16
22	Finish grinding Nos. 2 and 3 pins	Crank pin grs	200	
23	Finish grind Nos. 1 and 4 pins		200	
24	Straighten	Straightening press	500	2
25	Grind flange O.D	10x36 in. Norton gr	550	2
26	Finish grind center bearing	10x50 in. Norton gr	275	3
27	Finish grind No. 1 line brg	10x50 in. Norton gr	275	3
28	Finish grind No. 3 line brg	10x50 in. Norton gr	250	3
29	Grind 2 gear fits	10x36 in. Norton gr	275	3
30	Drill 0.374 hole	Allen drill press	500	2
31	Mill 2—No. 28 Woodruff keyways	Bristol and steptoe mill'g machines	275	3
32	Mill 1—No. 3 Woodruff keyways	Bristol and Steptoe mill'g machines	500	2
33	Burr six holes	Allen drill press	800	1
34	Ream six flange holes	Prentice sldg. hd. dr. pr.	800	1
35	Grind face of flange	10x36 in. Norton gr	550	2
36	Balance	No. 8-B Ransom and Bridgeport grs	275	3
		20th Century bal. stand.		6
37	Face back of flange and chamfer	16 in. x 6 ft. Reed lathe	500	2
38	Hand ream 0.374 in. hole and 2½ in. holes; also file burrs	4 men		
39	Lap pins and bearings	Blount speed lathe	250	3
	Straighten	Springfield str. pr	500	2
				110

trueness. The arrangement of indicators on the substantial bar beside the shaft shows how they are used on the bearings and the flange.

Another fixture is used to check the crankshaft shoulders, using spacing blocks and feeler gages. This also checks the radial location of the crankpin bearings. Fig. 10 shows the running balance test on an Akimoff machine.

A convenient method of balancing a crankshaft is shown in Fig. 11, this method being used in the shop of the Lexington Motor Co., Connersville, Ind., in

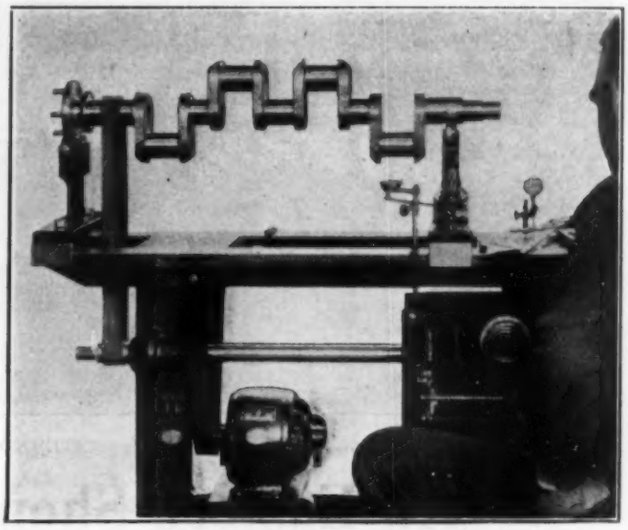


FIG. 10. TESTING FOR BALANCE

marking the Ansted motor. The balancing machine is of the Carwen type but, as will be noted, an electric drill has been mounted conveniently at the back so as to drill out a little weight at any desired point. One

TABLE III. DATA RECORDED AT UNION SWITCH AND SIGNAL CO., SWISSVALE, PENNSYLVANIA

	6636R No. 1	6636R No. 2	36R No. 1	36R No. 2	36Q No. 1	36Q No. 2	46Q
Cranks ground	291	292	270	333	403	356	209
Hours life	20½	25½	22	27½	38½	29½	14½
Cranks per hour	14.4	11.5	12.2	12.2	10.5	12.1	14.1
Dressings	17	23	22	24	26	24	20
Cranks per dressing	17.1	12.7	12.2	14	15.5	15	10.5
Cubic inches wheel wear	465	319	495	369	495	369	495
Cranks per cu.in. wheel wear	0.62	0.91	0.54	1.1	0.81	0.96	0.42
Machine used	Landis	Norton	Landis	Norton	Landis	Norton	Landis

Note, The first two wheels are made of No. 66 alundum, 36 grain, grade R. The others are regular wheels.

of the handwheels moves the drill to the desired position and the other wheel feeds the drill into the work. This arrangement saves handling the crankshaft in and out of the balancing machine and enables the proper balancing to be secured easily and quickly.

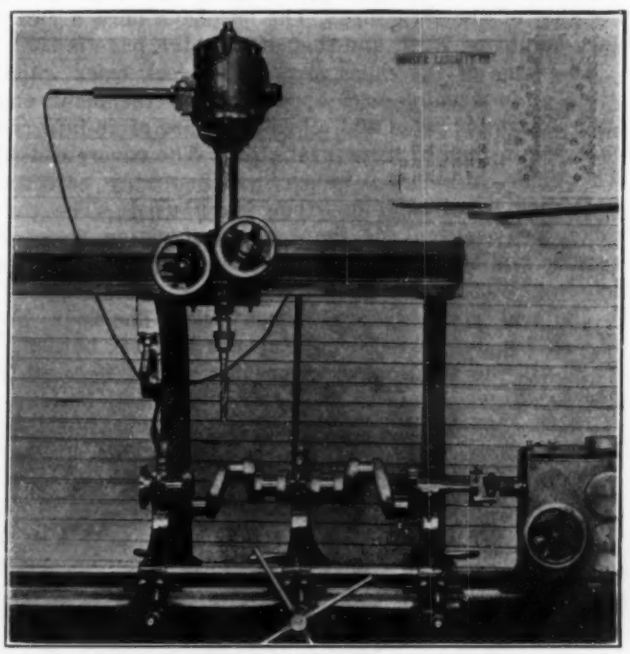


FIG. 11. BALANCING LEXINGTON CRANKSHAFT

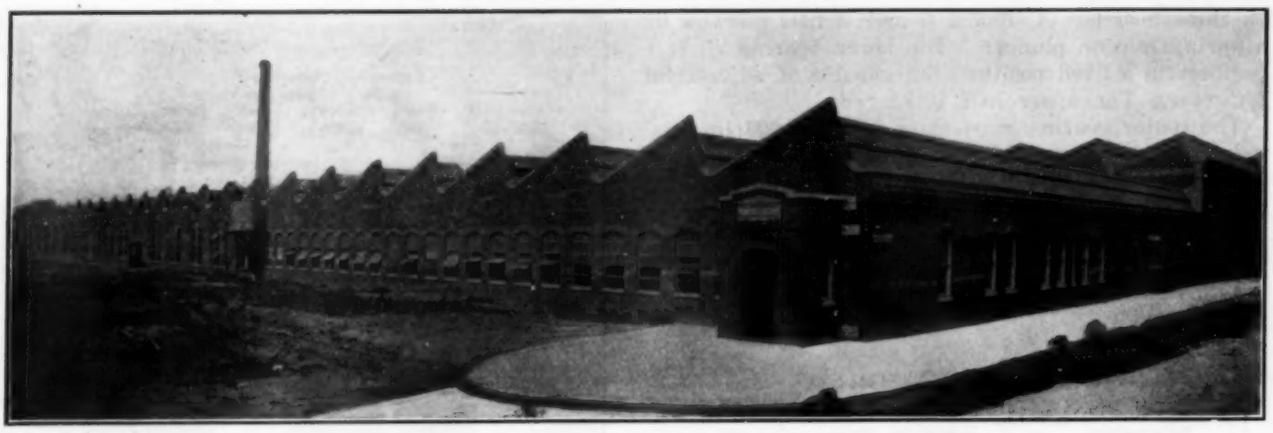


FIG. 1. EXTERIOR VIEW OF THE PLANT

An Eastern Shop of Modern Design

Machine Tool Plant with Saw-Tooth Roof and Reinforced Concrete Frame—Mercury Vapor Lamps for the Shop—Good Railroad and Power Facilities

BY C. E. CLEWELL

THE new plant of Gould & Eberhard, at Irvington, N. J., furnishes a unique example of the good results which may be accomplished by careful advance planning of the shop buildings and their equipment so as to fulfil the exacting requirements of highly efficient production. Fig. 1 shows the general plan of these shops with the main office entrance in the foreground, the plant having a floor area of 135,200 sq.ft., not including the powerhouse.

PLAN OF THE BUILDINGS

In Fig. 1 the shops are shown with their total length of 520 ft. extending to the left, and with a 260 ft. width to the right. This width is made up of eight low bays each 20 ft. wide on the side nearest the reader in Fig. 1, with two high bays, each 50 ft. wide, on the far side of the structure. The low bays have a clearance height of 13 ft. and that of the high bays is 25 ft.

The walls of the shops are of Fisk lock brick which gives an unusually good appearance to the plant and the roof construction and all columns are of re-inforced concrete instead of structural steel. The concrete used was made of cement mixed with suitably screened Bethlehem steel slag, no stone being used. The concrete trusses used for the roof construction were all cast on the shop floors and assembled in place as the building was completed.

The roof consists of red cement tile. The floors are of 6-in. concrete covered with master builders hardener. Back of the shops, the powerhouse and a 40 x 60-ft. heat-treating building are located. These buildings with the 165-ft. Heinicke stack are seen at the right of the center in Fig. 2. The roadways at and about the shops are constructed with a base of slag obtained from a near-by smelting works. Near the powerhouse a sub-structure oil tank with 12,000 gal. capacity is located, with a feeder to the railroad spur, and provided with steam coil to prevent freezing. A 500-ft. artesian well is used for the supply of all drinking water and for the toilets, Newark city water being used, however, for the boilers of the powerhouse.

The outlines of the saw-tooth roof construction and the side wall windows are indicated in Fig. 1. All roof sash has a northern exposure and the window glass is of the ribbed type with the ribs vertically placed so as to diffuse the light in horizontal directions. All sash is of this ribbed type both in roof and side walls except in the two lower sashes of the side wall windows, which are equipped with clear glass for psychological purposes, the management taking the stand that there is a natural tendency for employees to look out of the windows occasionally, and that the use of ribbed glass for all sash to prevent this is a hardship to the men with little or no gain in time.

The Fenestra sash used throughout, is arranged in the saw tooth construction so that every sash in the high bays may open, while the sash in four only of the eight low bays across the shop are arranged for opening. All movable roof sash is hand operated. To avoid excessive glare from direct sun light through the side windows with a Western exposure, a row of oriental planes is planted along the West side of the shop in the adjacent yard space. The shade from these trees is intended ultimately to tone down the bright Western sunlight, which may at times prove objectionable otherwise, due to the absence of near-by buildings of other plants.

The natural lighting is unusually soft and adequate in these shops, even at noon on a summer day, due to the Northern exposure of the roof windows and the diffusing effect of the ribbed glass, and it furnishes an excellent example of the splendid results which can be accomplished in one-story structures even where the width is nearly 300 ft., as in this case.

A good deal of attention was given in the preliminary planning of these shops to the question of a one-story versus a multiple-story structure. The matter of increased land space with the one-story building was not a factor, however, because of the location of the plant in a comparatively unsettled suburb of Newark, with a large tract owned by the company.

The attitude taken in favor of the one-story plan

was based partly on the prevention of delays which always enter into high buildings, because of elevator service, and partly because of what was felt to be a distinct advantage of the one-story building in the flexibility of department arrangements and in the important matter of effective routing of material. Natural lighting is, of course, simplified in the one-story plant if the aisles are wide.

Some of the advantages in routing with the one-story structure will be apparent from the methods used in this plant. Fig. 3 shows a general plan of the shops. A spur of the railroad enters the shop at the left and raw materials are unloaded here. Light parts progress to the right along the low bays, all heavy work being done in the high bays, this also progressing to the right as in Fig. 3. The finished parts meet for assembly at the right end of the shops and shipping is done from entrances at the extreme upper right-hand corner to the railroad spur which runs along the upper side of the shops. The simplicity of this routing scheme with the one-story building could not be realized in a building with a number of stories, and its obvious advantages form the underlying basis for the choice of the one-story shop.

The management has, furthermore, standardized on the unit assembly system and on the method of returning each part after an operation or group of operations to one central inspection department, from which it goes to the next succeeding operation or group of operations.

Ball bearing Chapman hangers and compression supports are used throughout and the efficiency of the line shafting system as a whole is shown by the relatively small power demands on the powerhouse, in comparison with preliminary estimates based on older equipment. The use of single-pulley shaft drives with geared tools is illustrated by this diagram and will be referred to again.

The use of numerous cases of individual motor machine tool drives has reduced the need of line shafting considerably and has been provided for in advance by a well designed layout of floor conduit containing the branch circuits to individual machine tools in conjunction with the two trenches or tunnels which extend the full length of the shop down the center, and which run back to the powerhouse as indicated in Fig. 3.

The supports for line shafting are made up of I-beam framework suitably attached to the concrete shop columns by special clamps, and a great degree of flexibility in the alignment of pulleys and adjustment of belts has been found to result from this scheme. A given line shaft with its single pulleys is driven by a group motor supported from overhead, belted to a larger pulley on the line shaft. The generating equipment of the powerhouse consists of a 500-kw. Sprague direct-current generator, direct connected to an 800-hp. slow-speed Corliss engine. Two Sprague 15-hp. balancers are employed with the main generator, to make possible the use of a three-wire system which gives pressures of 110 and 220 volts throughout the shop.

For break down service, a 100-kw. rotary converter is installed, by which the alternating current supply of the public service station may be converted into 110 and 220 volts direct current in case of emergency. An additional safeguard in the event of a powerhouse break down, is a transformer outside the shops, which is connected to the public service lines and which can be used for certain lights, for the watchman's lamps and for the dictating machines. In this way, it is possible to operate the Mazda lamps in the offices and drafting rooms for artificial lighting independent of the shop powerhouse, in case of necessity.

Attention, in the design of the powerhouse, has been given to additional space in case of expansion to the plant and to details which add greatly to the appearance of the plant. Thus, room has been allowed in the generating room for an additional engine and generator as a duplicate of the present equipment. As an example of the care to details of appearance, the pit under the generator frame is lined with white enamel bricks and a generous supply of natural light is afforded by the side wall windows. Complete switchboard arrangements are available for the convenient changeover from the powerhouse supply to the breakdown service of the public service company.

The boiler room, as part of the powerhouse, contains three 250-hp. Babcock & Wilcox boilers, two of which are used at a time with a third as a reserve and with provision of extra floor space for one additional boiler if required later. Superheaters are used with the boilers and all boiler fittings are made of brass, which are expensive but more lasting.

The coal is transferred from the adjacent coal bunkers to bins above the furnaces, which are equipped with Murphy rocking grate stokers. The coal bunkers are on a level with the boiler room floor and are under two tracks of the railroad, provision being made in the roof for unloading the coal from the cars either through the floor of the car or by shoveling it over the side of the car through openings in the roof beside the tracks.

At the base of the stairway leading from the engine room to the boiler room there is a tunnel opening, this tunnel extending from the powerhouse across the open yard space to the shops and through the entire shop under the center of the floor space. This tunnel is 7 ft. high and is constructed in two sections, with a concrete partition between. One section carries the electric supply circuits in conduit, and the other contains the steam, water and sewer piping. This tunnel is open at the north, or extreme shop end for ventilation pur-

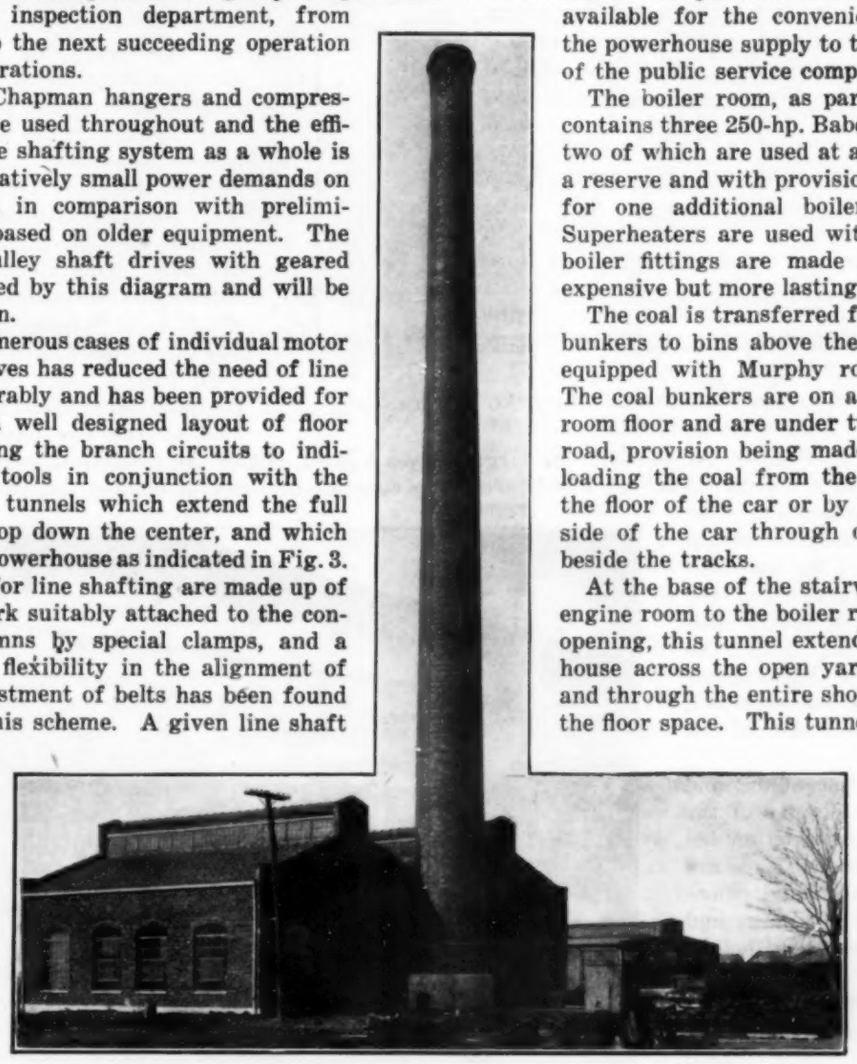


FIG. 2. EXTERIOR VIEW OF POWERHOUSE. THE RAILROAD TRACKS FOR COAL SUPPLY AND SHIPPING PURPOSES RUN BESIDE THE POWERHOUSE

poses, is properly drained and lighted, and is provided with a manhole every 100 ft. throughout its length. The tunnel serves as the distributing point for the electric power branch circuits for lamps and motors.

The disadvantage of having a separate office building as a hindrance to the expansion of the shops, led to the adoption of a portion of the shop space for the offices and the drafting, production and planning room, shown in Fig. 4. In other words the bays of Fig. 4 are provided with the necessary support openings in the roof trusses and in every respect are adapted to quick conversion into manufacturing space if this should be necessary at any time. It may be stated here that it is possible to extend the plant at any time 100 ft. on the North, 150 ft. on the East and 100 ft. on the South. An excellent idea of the general arrangement of the 60 x 100 ft. drafting and associated departments is given in Fig. 4. At the left the large special 8 x 16 ft. desks are shown, each of which provides space for six employees. The concrete roof trusses are also clearly visible in this view and the space between the sloping trusses and the roof may be seen, this providing incidentally a good space for holding the conduit used for the lighting or power circuits. Note the side wall windows and the light color of the concrete surfaces.

The offices are adjacent to and north (at the left in Fig. 4) of the drafting room, with a partition between. Practically no partitions are used, however, for individual offices except in one or two instances, and where such is the case 4-in. hollow tile is employed for the partition. An interesting feature of the office is the use of skylight sash horizontally placed over the offices which conceal the saw-tooth construction and give a finished appearance to the space.

FIG. 4. DRAFTING, PRODUCTION AND PLANNING ROOM, SHOWING LARGE DESKS ACCOMMODATING SIX PEOPLE EACH. NOTE ROOF DETAILS

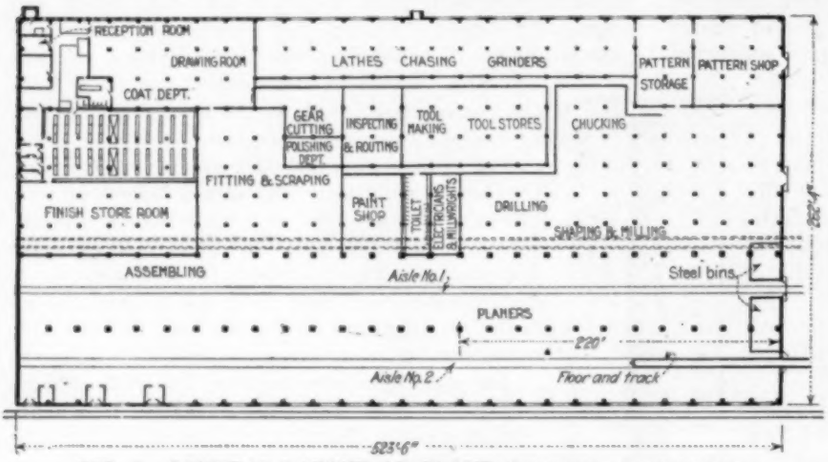


FIG. 3. GENERAL LAYOUT OF PLANT, SHOWING BUILDINGS FOR SHIPPING

This auxiliary sash is slightly separated from the holding frame to produce ventilation. In Fig. 5 the aisle of one of the high bays is shown, this being a general view of the assembling department. In the distance, the entrance for raw materials may be seen, this doorway being large enough to admit a freight car. This assembly section is near the north end of the shop and near the shipping department. Note that these two high bays contain the large sizes of work, while the smaller work is mainly confined to the low bays at the left, seen in the distance. This view shows the reinforced concrete runway for the cranes, which is an interesting structural detail of the plant.

In Fig. 6 there is a view of the scraping department that shows a portion of the low bays. This picture gives a good idea of the method of mounting clamps on the concrete columns for holding the small crane runway.

FIG. 5. GENERAL VIEW OF ASSEMBLING DEPARTMENT SHOWING THE HIGH BAYS. NOTE REINFORCED CONCRETE CRANE RUNWAY

One of the most interesting details of this plant is the absence of vibration and the greatly reduced noise in comparison with a structural steel shop. It is difficult to realize in the drafting room, separated from the shop only by a 4-in. hollow tile partition, that the shops are running under normal conditions. The use of concrete runways for the cranes, with pine boards under the track, almost completely removes crane vibration.

The shop work is conducted on the hourly basis with the addition of a premium system. Time keeping is based on the periodograph. Due to the distance of the shops from the nearest trolley line, the company maintains the equivalent of a bus service to and from the plant in the morning and afternoon by converting its freight trucks into buses, temporarily, by putting a special body on the truck shortly before it is needed.

The fireproof construction of the plant makes a shop fire alarm system unnecessary and no fire protection is provided except an extinguisher system for the shipping room. The watchman uses a portable clock with keys at set stations, as usual in such cases. The trucking

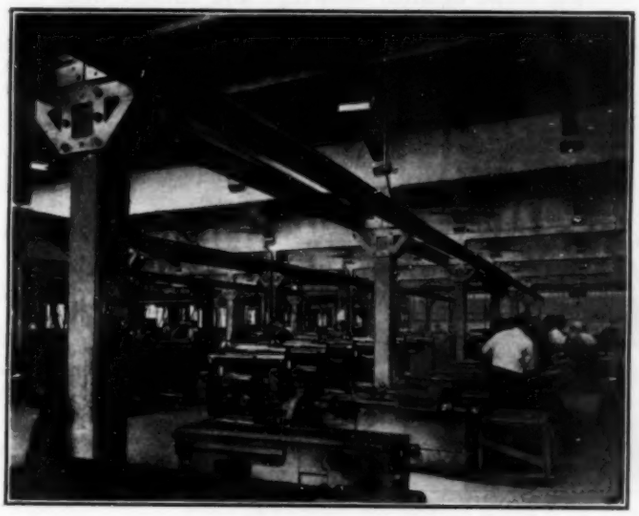


FIG. 6. SCRAPING DEPARTMENT. NOTE CLAMPS ON THE CONCRETE POSTS FOR SUPPORTING CRANE RUNWAY

problem is simplified by manufacturing as far as possible from platform to platform. Hand trucks are used with no electric trucking devices.

(*To be continued in next month's issue.*)

Tap and Die Standardization

To effect economies for consumers by introducing improved, and eliminating archaic styles, types and sizes is a primary purpose of the Tap and Die Institute. It is estimated that since 1917 when intensive work of this character was actively taken up, the total reduction of lines in the small tool industry has approximated 40 to 50 per cent. In this it functions somewhat as a central laboratory for the receipt and analysis of information which is distributed throughout the industry and among consumers in the form of a standard catalog containing standards based upon consolidated experience.

This catalog being the summarized demand is an educational influence and, because it is known to embody the best and most modern engineering practice, tends to induce consumers to adopt its recommendations. No attempt is made to force their acceptance.

What Are the Worker's Prospects in the Machinery Building Industry? —Discussion

BY GEORGE J. BUCKNER

Having read the article on page 667, Vol. 55, of AMERICAN MACHINIST, under the above heading, I have thought the matter over from as nearly an impartial point of view as possible, and I must say that I cannot agree with the writer in the position he takes toward the college man.

I am a college graduate, have worked in machine shops with and for both college and practical men, and have found very admirable men of both types. I have been very much disgusted with graduates at times because of their apparent lack of ability to go ahead with a job without constant help. But I have come to the conclusion that these are rather the exception than the general rule.

There are misfits in every trade and profession and diploma holders are no exceptions. I believe that the "boss" who has received his training through the school of hard knocks is too apt to judge the whole class of college men by the small group known as "rah rah boys," whose fathers sent them through school in luxury and ease. These boys amount to little on their own merit.

Consider the average graduate. He is eager to work, to learn and to move ahead. He very seldom makes as good a mechanic as the boy who started at fourteen. And why should he? He is handicapped with an eight years' start on a job which requires more skill in manipulation than quick thinking and general knowledge. The latter is the field in which the student has been trained. But turn him loose on a new problem, such as re-arranging the equipment of the shop for large production on a new type of work, and he will surprise you with the number of unseen details which he will take into account in his scheme.

If he has a half a chance, the college graduate will become a leader, not because he is a better mechanic than the others, but because he has a bigger, broader view of the work around him. The supply of jobs for leaders is relatively low and there will necessarily be many college men, who have been side tracked into positions of small importance. But you will usually find them ready and equipped to step into a vacancy above.

To quote from Mr. Bruce Barton's interview with Dr. James R. Angell in the November issue of the *American Magazine:*

"A notable instance of the value of college men is furnished by the Western Electric Co., which began employing college men about 1896 and which has found that 90 per cent of them made good, as compared with 10 per cent of the men who enter business on leaving high or grammer school."

In looking over the list of executives in our own company, at the local plant of which about 7,000 men are employed, I find that 80 per cent of the highest officials, 70 per cent of the superintendents and 60 per cent of the assistant superintendents are college men. And only 1 per cent of all the men in the country are college graduates! I am very reluctant to believe that fathers are spending thousands of dollars, states and cities spending millions, and men and women spending four good years of their lives to find out that it is all in vain.

Apprenticeship System at Rock Island Arsenal

Devices for Teaching—Use of the Slide Rule—Action of Gear Teeth and the Selection of Proper Views for Drawings—An Outline of the Courses Given

BY WILLIAM BAUMBECK
Superintendent of Production

DURING the past year much has been written about the apprentice system established in manufacturing plants and very valuable information has been given regarding the methods to educate boys for a trade and later for better positions. The public at large, and especially the machine tool manufacturers, possibly do not know that the Government in its several arsenals and navy yards has established an apprentice school system for machinists, patternmakers and other trades. This article has been written to tell about the apprentice school and the course of instruction given to the boys at the Rock Island Arsenal.

The school was established May 16, 1910, with one student. Since that date, and up to Dec. 31, 1920, one hundred and three students have been graduated, and on May 1, 1921, eighty-three apprentices were employed. The year 1920 being the most successful and the one in which the largest class was graduated, the system of instructions used during that year will be shown.

FIG. 1. THE APPRENTICE SCHOOL.

FIG. 2. LARGE MODEL SLIDE-RULE

The instruction courses are made as practical as possible with the idea of making efficient mechanics of boys who have not had high school or special training. Mechanical drawing and mathematics have been selected to fit conditions, and each student is expected to and must make such progress as his capacity and interest to learn will permit.

The course of instruction is divided into nine grades. Six months' service constitutes one grade, with the exception of the ninth grade which requires twelve months' service and is known as the fifth-year course. In a way it is what is commonly known as the "part time, short unit course," as advised by William A. O'Lary and Charles A. Drosser in United States Bulletin No. 159, with the exception that this course aims to develop the initiative and resourcefulness of the apprentices more fully.

NOTE: Instruction procedure and special instruction devices contributed by the originator G. E. Stanford, instructor of apprentice school.

A schoolroom with drawing tables, library and other study facilities is provided as shown in Fig. 1. Drawing paper, ink, pencils, etc., are provided by the Government. The students are required to furnish their own drawing tools. Mechanical drawing plates are used from those issued by the International School of Correspondence and the Santa Fe System, but mostly copies of drawings used on production work at the arsenal are furnished for test uses.

Students are given four hours each week for instruction in the classroom—two hours on drawing and two hours on mathematics. They are required to work examples, make detailed drawings and submit them for correction. Every two months examinations are held and work rated accordingly. No specified day is set for examination so that no special efforts can be made in advance by the boys, who, in consequence, are sometimes caught unprepared.

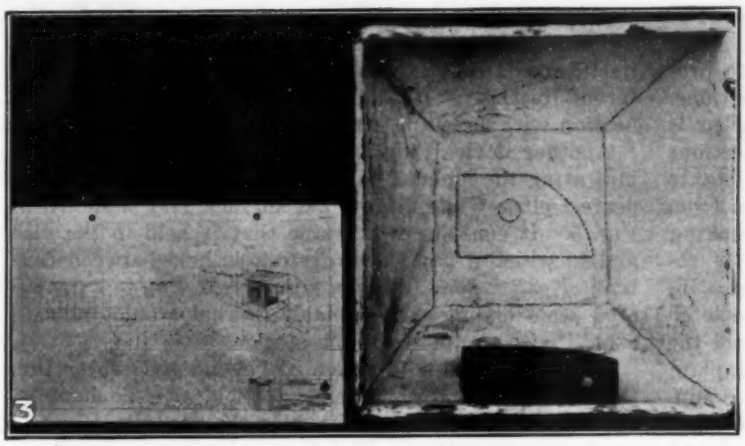
Records of attendance, class work and deportment are kept on permanent cards.

The following instruction books on mathematics are used:

1st year—"Shop Mathematics" Part 1, Morris & Smith.
2nd year—"Shop Mathematics" Part 2, Morris & Craig.
3rd year—"Practical Applied Mechanics," J. W. L. Hale.
4th year—"Practical Mechanics and Allied Subjects," J. W. L. Hale.

First Year: The first two periods of the first year course involve a review of much of the eighth-grade work in the common schools, passing on to studies in shop mathematics, drawing and applied science. In the review work much emphasis is placed on those subjects which pertain to shop practice, as ratio and proportion as applied to pulleys and gears and mensuration as applied to volumes and areas. After this review the subjects of levers, inclined planes, horsepower, hydraulics and heat units are covered in turn.

The arsenal is fortunate in having a well-equipped testing laboratory at its command and much of the instruction received in the schoolroom is further supple-



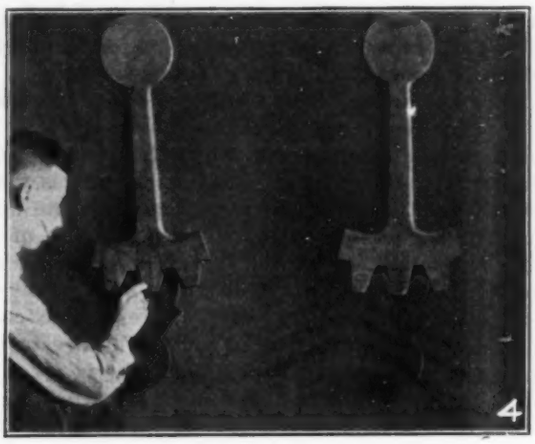


FIG. 3. MODEL TO TEACH PROJECTION. FIG. 4. MODELS OF GEAR TEETH

mented by instruction in the testing laboratory. Individual instruction is the rule at all times, this method maintaining the interest of the student while the instructor is better able to meet the individual needs of the student, and to inspire and influence him.

Second Year: The third and fourth periods, or second year instructions, are given in what might be called shop mathematics, involving algebra, geometry, trigonometry and logarithms, in so far as these subjects pertain to shop practice. Before the apprentice is through with the above he has passed from the second year and is well along in the third year or fifth and sixth periods.

Third Year: By the time the boy has reached the sixth and seventh periods he is usually well enough advanced in age and experience to understand and appreciate the value of the school in respect to learning a trade, and is in need of guidance more than encouragement and inspiration. Much time is devoted to review of subjects already given and many practical applications relating to trade problems are made at this time.

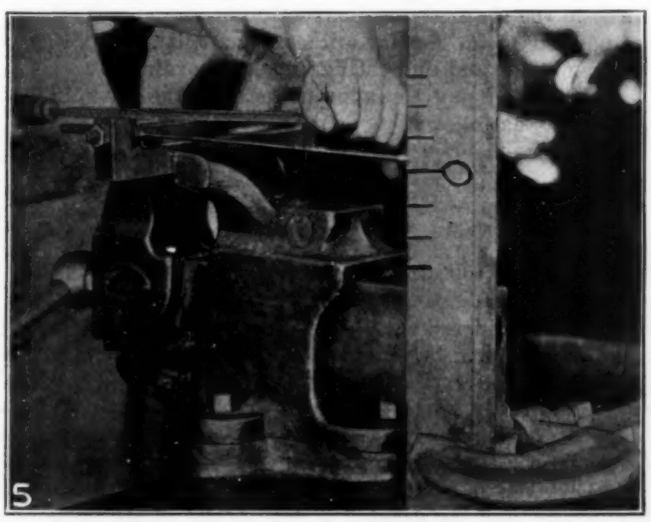
Fourth Year: Through the seventh and eighth periods, or the fourth year, some special subjects are taken up such as electricity and strength of materials, in so far as they pertain to shop practice.

Fifth Year: The fifth year, or ninth period, is optional and the boy is in fact graduated in his fourth year. If he chooses the fifth year, and the majority of boys do so, and has at the same time completed all the subjects prescribed, he is given further instruction relating to application of principles already learned. This course is largely made up of laboratory work pertaining to practical mechanics. Most of the apparatus can be made by the apprentice as he proceeds in the studies. In this particular he gets much experience in the testing laboratory, previously mentioned in this article.

During the entire time very simple principles of teaching are employed. No attempt is made to organize classes as such and every effort is made to inspire a boy to do his best. Practically the whole system of teaching is based upon the one word "interest" which, interpreted in every-day language, means "it is between us." The instructor feels that in order to teach successfully he must first know well the subject, be able to impart this knowledge and also to inspire the pupil.

The purpose of this course is not to make finished draftsmen, but to enable the boy to read correctly certain drawings as used at this arsenal. The course in drawing as given here is what might be considered by some "a mongrel course" inasmuch as it is made up of drawings taken from several sources, always with the idea in mind of the particular needs of the boys.

Much that is considered worth-while in a complete course is omitted here; for example only eight plates are given in geometric construction and intersections. Throughout the entire course an effort is made to teach



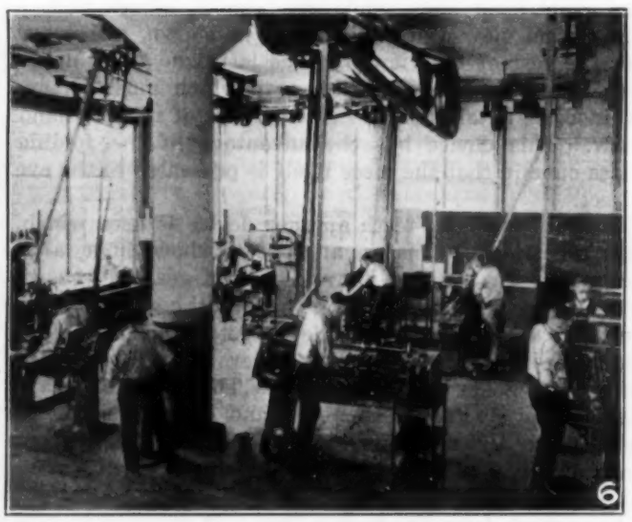


FIG. 5. TEST FOR FILING FLAT. FIG. 6. THE SCHOOL SHOP

a boy not only to draw, but to teach him to think. For this purpose the instructor has prepared many plates of parts known to the boys, but incomplete as to procedure and detail. This forces the boy to ask questions.

In some cases the blueprint which is to be used is marked with a warning to watch for wrong projections or incorrect dimensions. The method forces the boy to be resourceful and at the same time prevents him from becoming a mere copyist. For the purpose of making the boy think for himself much original work is required. For example, he is given a blueprint and information for a tie rod sleeve. After he has completed this drawing he is asked to draw a fixture to hold the sleeve in a milling machine. Again he is given a plate showing a projection of a center crank which he is supposed to draw, and this is followed by a request to make a double-throw crank from the same data given and then following this, a three-throw crank of 120-deg. centers.

Toward the end of the course, boys are required to produce drawings that conform to usage and standards, as used by the Government at this arsenal, and the so-called "Green Book" of instructions, used by the Government, becomes in part a text book of the school.

Special Devices Used

There are some devices used here as aids in teaching that might be considered special, if not unique, as the writer has not seen them used in any other school of this kind. A particular case is the method of teaching the use of the slide rule. A large rule, 8 ft. long, having numbers and graduations large enough to be seen across the room, is screwed to the wall as shown in Fig. 2. This rule not only answers the purpose of instruction but becomes a tool for the student as well, having the advantage that the instructor is able to see at a glance and from a distance, just how the user proceeds with the problem at hand.

Another unusual device in use is one that might be called, in a mechanical drawing course, a "view determinator." This device, along with the standard drawing showing the system of projections, is illustrated in Fig. 3. It is made to represent the form of a square tin pan, the top view of which is rectangular in shape, while the sides are given an even curve down to a flat rectangular bottom. The effect is that if an object is placed within the pan and then pushed to the right on the right-hand side, while the pan is before you, a right-hand view of the piece will be shown, and so on for the rest of the view, i.e., the left-hand view, upper and lower views, except the rear which must be explained, as it takes its place at the left of the left-hand view. This device has the advantage of the folding glass cube in that the piece itself is presented to the eye direct.

In studying gear teeth another device is used which, like the slide rule, is an attempt to show on a large scale the forms of the different kinds of gear teeth used. This device, as seen in Fig. 4, is nothing more than sections of large gears made to rotate about centers that would otherwise be the centers of the shafts to which the gears would be fitted. These sections have only the pitch lines, addendums and dedendums shown and are used in very much the same way as the teacher in the grammar school teaches geography with a map on which the names of the rivers and cities are left off. The student, from the models shown, is required to give the kind of gear, the diametric pitch, the circular pitch, the pressure angle, etc. Experience has taught the writer that the matter of interference is best taught by itself, and is best explained in connection with the different forms of teeth, and is partly brought out in connection with the stub tooth model.

Another device that is claimed to be original is for indicating the amount of deviation a boy makes from a perfect plane while filing a flat surface, and is shown in Fig. 5. It consists of a frame that is held in the vise and in which a flat piece of stock is held between centers. Near the end is a long pointer pointing to a graduated scale having a zero mark at what would indicate a level with the plane of the stock.

As the left hand is extended beyond the center line the weight of the hand tends to hold the file hard at the outer edge of the stock; also the opposite effect is produced when the right hand is farthest away from the center. The real value of the device is to show to what extent the boy is in error and also shows how few there are who are able to use the file and at the same time keep the pointer at the zero mark.

A vestibule machine shop, Fig. 6, is provided with standard machines—shapers, planers, milling machines, drilling machines, etc. Here the student receives first hand instructions in the use and care of machines; is instructed regarding the feed and speed of them and is given minor parts to manufacture. From time to time students are sent into the shop for observation purposes and when advisable they are given production work.

The following schedule is used on machine-shop work:

First Year

Machinists' helper	2 mo.
Steel room	1 mo.
Toolcrib	2 mo.
Drilling machine	1 mo.
Plain milling machine	2 mo.
Small engine lathe	4 mo.

Second Year

Slotting machine	1 mo.
Smaller shaper	1 mo.
Bench work	2 mo.
Planer	2 mo.
Hardening and annealing	2 mo.
Tool grinding	2 mo.
Erecting	2 mo.

Third Year

Large lathe	2 mo.
Universal milling machine	1 mo.
Gear cutting	1 mo.
Boring mill	1 mo.
Turret lathe	1 mo.
Millwright	1 mo.
Large shaper	1 mo.
Large slotter	1 mo.
Millwright work in assembling	3 mo.

Fourth Year

General Shop Work, or a twelve months' review of the first, second and third years.

NOTE.—The apprentice will not be held on one line of work more than one month.

Fifth Year

Die sinking	1 mo.
General toolroom work	2 mo.
Smith shop work	2 mo.
Foundry	2 mo.
Physical laboratory	1 mo.
Chemical laboratory	1 mo.
Planning room	2 mo.
General shop work	1 mo.

Several instructors are in constant touch with apprentices in the shop, giving instruction on the manufacture of parts used for regular ordnance material. This work is then submitted and ratings made accordingly.

The rate of pay for apprentices, for the year 1920-1921, was as follows:

1st period	$2.08 per day	5th period	$3.44 per day
2nd period	2.24 per day	6th period	3.76 per day
3rd period	2.64 per day	7th period	4.24 per day
4th period	2.96 per day	8th period	4.56 per day

9th period, 5th year ..... 5.12 per day

The results obtained from using apprentices in the shop after graduating have been very satisfactory. The boys are considered very high grade mechanics. Several apprentices have become assistant foremen, toolmakers and experts on experimental work.

It is entirely up to the boy to take advantage of the opportunities given, as the schooling and instruction as given at the Rock Island Arsenal are of the best that can be given in any special purpose or technical school anywhere, and the arsenal is very proud of its purpose and its accomplishment.

Wear on Various Automobile Gear Steels

Results of Tests Showing Wear Due to Difference in Quality of Material Heat-Treatment and Shape of Teeth—A Tooth-Profile Indicator

By E. R. ROSS
Experimental Engineer, Warner Gear Company

THE purpose of gears is to transmit power at different speeds, efficiently, quietly and with maximum life. To do these three things two additional considerations must be taken into account; namely strength and wear, the latter being the more important. If the gear tooth is made of suitable material and of such proportions as to minimize wear, generally speaking the tooth will be amply strong.

Quoting R. J. Chapman in his article "Research Work on Gears Needed," which appeared in AMERICAN MACHINIST, July 1, 1920: "Success in designing gear drives to operate satisfactorily under specified conditions is very largely a matter of appreciation of what has been done before under very similar conditions. The Lewis formula, being a formula for strength only, is of no assistance in selecting the most suitable combination of pitch, diameter, face width and material for the purpose. Experience can only determine these proportions, because, even though the gears be made to a fine degree of accuracy, and be capable of transmitting the load without tooth breakage, it does not necessarily follow that they will be satisfactory in operation.

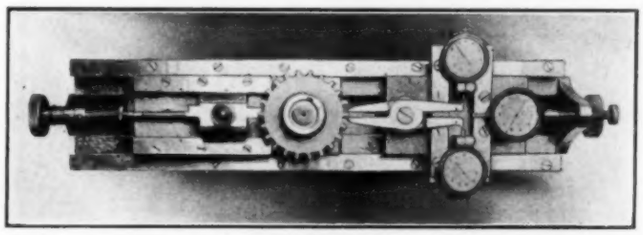


FIG. 1. SPECIAL INDICATOR FOR DETERMINING WEAR

"Further investigation should be made to establish reliable data relative to the various factors that determine the smooth operation and life of gear trains. The research could be divided into three classes. The work in section one would be to establish the most suitable material for use under given conditions, the allowable stress, the allowable pressure, the resistance to abrasion, the elasticity and such things being found for different materials. Section two would deal with methods of manufacture, and an attempt would be made to define the degree of error permissible with various grades of workmanship. Research in section three would determine the influence upon life and quiet operation of gears of such variables as peripheral velocity, load per unit of breadth, number of impacts, ratio of reduction, grade of workmanship, heating, and the disposition of metal in the gear rims and arms; methods of gear mounting to absorb vibration, and the lubrication of gears would receive attention.

"It will be agreed that successful research along these lines would provide dependable data for the design of gears to meet any conditions in regard to load, speed, quiet running, life and such points. Alone, the Lewis formula can be used only to ascertain the maximum permissible load to insure freedom from tooth breakage. With many gears this is the only point checked by the gear designer, with the result that they are transmitting excessive pressure, so that backlash and noise develop in a very short time."

Mr. Chapman in this article not only placed a very just criticism, but has gone a step further in that he suggested the line of procedure that must be inevitably followed if gears are to maintain the important position they now occupy in the automotive and allied industries in the transmission of power. With this outline before us in compiling the data of our tests, we have attempted to solve some of the most important problems that face the gear manufacturer today.

The work we are now doing has been confined largely to the selection of materials best suited for the purpose

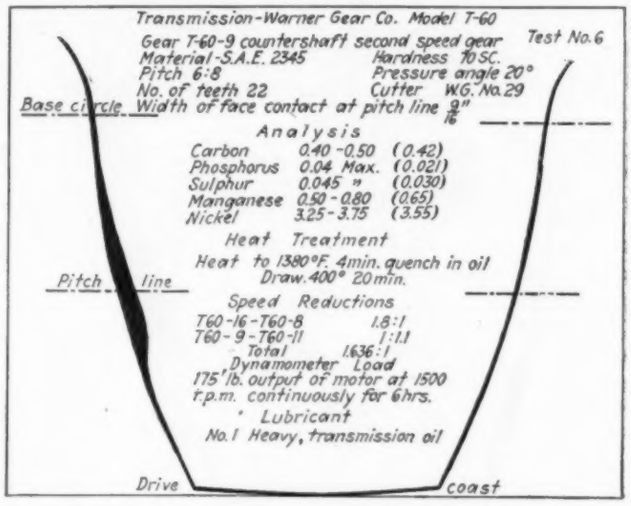


FIG. 2. WEAR OF A COUNTERSHAFT GEAR

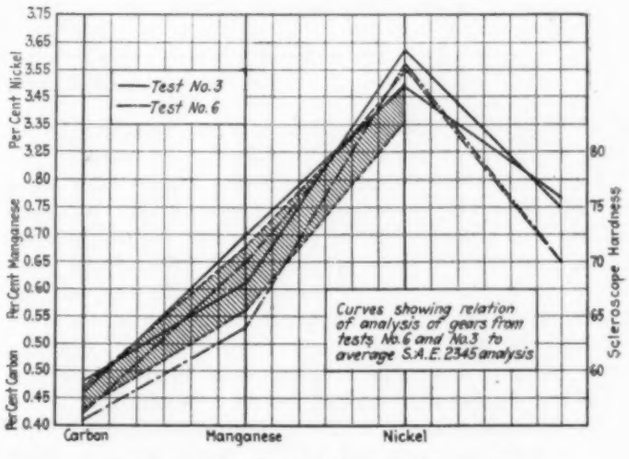


FIG. 4. ANALYSIS OF STEELS USED

Paper presented at the Rochester meeting of the American Gear Manufacturers' Association.

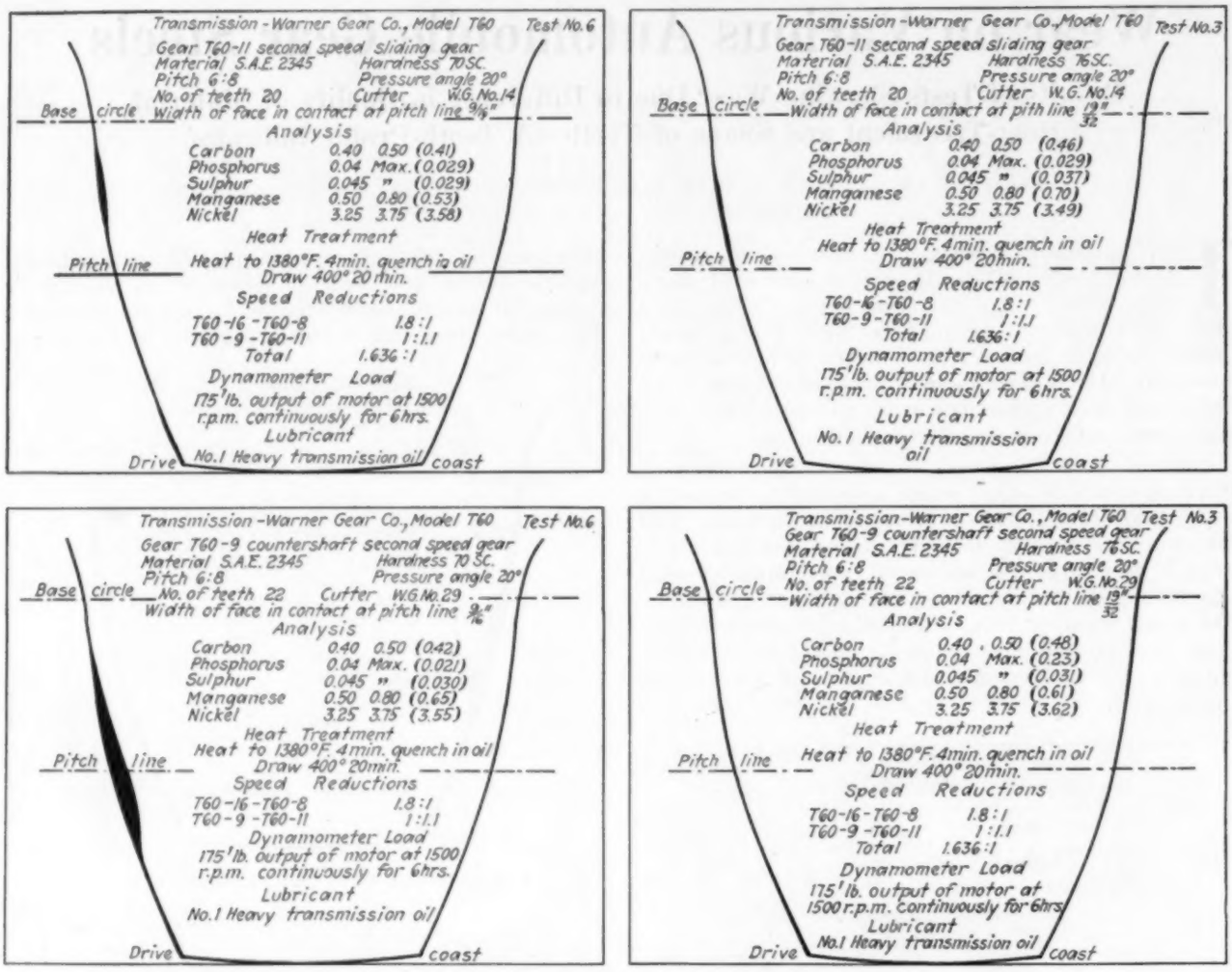

Transmission - Warner Gear Co., Model T60 Test No. 6
Gear T60-11 second speed sliding gear
Material S.A.E. 2345 Hardness 70 SC.
Pitch 6:8 Pressure angle 20°
No. of teeth 20 Cutter W.G. No. 14
Base circle
Width of face in contact at pitch line 9/16"
Analysis
Carbon 0.40 0.50 (0.41)
Phosphorus 0.04 Max. (0.029)
Sulphur 0.045 " (0.029)
Manganese 0.50 0.80 (0.53)
Nickel 3.25 3.75 (3.58)
Heat Treatment
Pitch line
Heat to 1380°F. 4 min. quench in oil
Draw 400° 20 min.
Speed Reductions
T60-16 - T60-8 1.8:1
T60-9 - T60-11 1:1.1
Total 1.636:1
Dynamometer Load
175 lb. output of motor at 1500 r.p.m. continuously for 6 hrs.
Lubricant
No. 1 Heavy transmission oil
Drive
coast
Transmission - Warner Gear Co., Model T60 Test No. 3
Gear T60-11 second speed sliding gear
Material S.A.E. 2345 Hardness 76 SC.
Pitch 6:8 Pressure angle 20°
No. of teeth 20 Cutter W.G. No. 14
Base circle
Width of face in contact at pith line 19/32"
Analysis
Carbon 0.40 0.50 (0.46)
Phosphorus 0.04 Max. (0.029)
Sulphur 0.045 " (0.037)
Manganese 0.50 0.80 (0.70)
Nickel 3.25 3.75 (3.49)
Heat Treatment
Pitch line
Heat to 1380°F. 4 min. quench in oil
Draw 400° 20 min.
Speed Reductions
T60-16 - T60-8 1.8:1
T60-9 - T60-11 1:1.1
Total 1.636:1
Dynamometer Load
175 lb. output of motor at 1500 r.p.m. continuously for 6 hrs.
Lubricant
No. 1 Heavy transmission oil
Drive
coast
Transmission - Warner Gear Co., Model T60 Test No. 6
Gear T60-9 countershaft second speed gear
Material S.A.E. 2345 Hardness 70 SC.
Pitch 6:8 Pressure angle 20°
Base circle
No. of teeth 22 Cutter W.G. No. 29
Width of face in contact at pitch line 9/16"
Analysis
Carbon 0.40 0.50 (0.42)
Phosphorus 0.04 Max. (0.021)
Sulphur 0.045 " (0.030)
Manganese 0.50 0.80 (0.65)
Nickel 3.25 3.75 (3.55)
Heat Treatment
Pitch line
Heat to 1380°F. 4 min. quench in oil
Draw 400° 20 min.
Speed Reductions
T60-16 - T60-8 1.8:1
T60-9 - T60-11 1:1.1
Dynamometer Load
175 lb. output of motor at 1500 r.p.m. continuously for 6 hrs.
Lubricant
No. 1 Heavy transmission oil
Drive
coast
Transmission - Warner Gear Co., Model T60 Test No. 3
Gear T60-9 countershaft second speed gear
Material S.A.E. 2345 Hardness 76 SC.
Pitch 6:8 Pressure angle 20°
Base circle
No. of teeth 22 Cutter W.G. No. 29
Width of face in contact at pitch line 19/32"
Analysis
Carbon 0.40 0.50 (0.48)
Phosphorus 0.04 Max. (0.23)
Sulphur 0.045 " (0.031)
Manganese 0.50 0.80 (0.61)
Nickel 3.25 3.75 (3.62)
Heat Treatment
Pitch line
Heat to 1380°F. 4 min. quench in oil
Draw 400° 20 min.
Speed Reductions
T60-16 - T60-8 1.8:1
T60-9 - T60-11 1:1.1
Total 1.636:1
Dynamometer Load
175 lb. output of motor at 1500 r.p.m. continuously for 6 hrs.
Lubricant
No. 1 Heavy transmission oil
Drive
coast

FIG. 1. WEAR OF GEARS OF DIFFERENT HARDNESS

of automotive transmission gearing, the selection being upon the basis of resistance to abrasion or wear.

Two standard transmissions were used which were checked over very carefully to assure us that we were not risking a possibility of error in our results by confining our tests to one transmission. Satisfying ourselves upon this point we proceeded with the test by alternating the two, preparing the one while we were testing the other. All parts were checked carefully after tearing down the transmission, likewise all new parts were carefully checked before assembling.

The transmission carries 6-8 pitch gears having ¾-in. face and is well adapted to the needs of a medium weight and medium powered passenger car or lightweight truck.

The test was run upon the material used in the second speed gears, or the third and fourth of a train of four gears. This selection was made on account of being the most used of the speed reductions in passenger car service, also on account of the difficulties presented in the manufacture of a sliding gear with internal clutch teeth. It is frequently used with a very high percentage of the full motor torque. These are also "clash gears" and accordingly a portion of the face width which they otherwise would have, has to be sacrificed in rounding the corners upon one end of the teeth to assist in meshing the gears. They have a combination of a higher pitch line velocity than the other reductions, together with a correspondingly lower maximum torque.

In order that we might duplicate the conditions of each individual test with those of any other test of the series, constant torque and constant speed were the first considerations. In order to accomplish this standand, dynamometer equipment was used.

To be able to properly and impartially classify our results, it was necessary that very careful measurements be taken of both the new and the worn tooth. To do this, we developed a tooth profile indicator, Fig. 1.

The gear is mounted upon a stud in the center of the instrument. At the left and pressing against the top and side of a tooth is a stop which is held in this position by the spring behind the block. This holds the gear rigidly in position. Diametrically opposite this stop on the gear there are two fingers carrying points over the edge or profile of the tooth. At the right are two dial indicators, one for each of these points which operates through a 1:1 lever. To the right and in the center is a third dial indicator used to determine the depth or distance in from the point of the tooth to the points of the indicating fingers. The indicating fingers carry knife edge points so that the readings upon the leverage of the fingers do not change from the 1:1 ratio and at the same time making the readings upon the indicators a true indication of the contour of the gear tooth.

In Fig. 2 is shown a plot of the countershaft gear of test No. 6. The shaded portion of the tooth is the amount of metal that has been worn from its face,

showing the location with reference to the pitch line and base circle. The point of maximum wear upon this gear was 0.012 in. deep and from 0.010 to 0.020 in. above the pitch line.

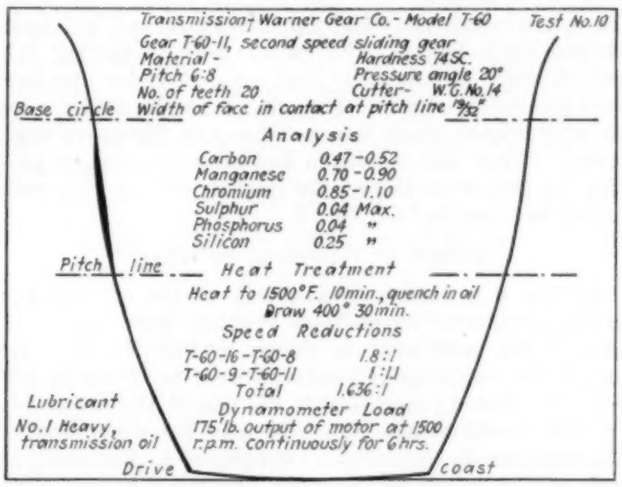
Since the wear is often unequal and we are unable to predict before the test just where it will be greatest, we select for measurement the tooth that shows the most wear. Fortunately the chamfered end of the mating gear leaves an unworn portion which can be measured after the run, enabling us to compare it with the worn portion of the same tooth. The plot is a comparison of the original outline with readings taken in the center of the worn portion of the tooth.

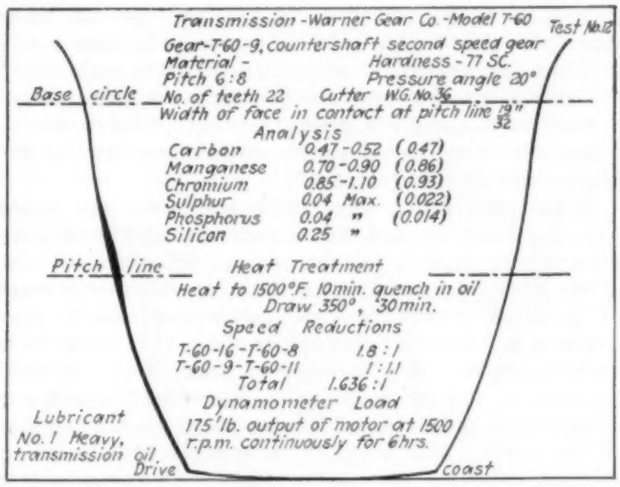
The Gear Tested

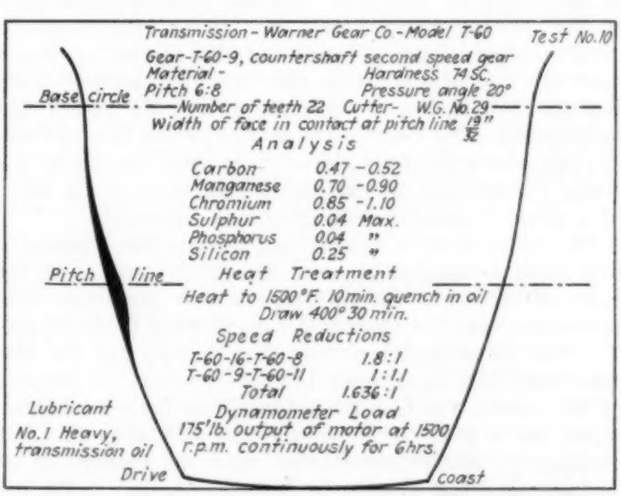
Covering the various items as they appear printed upon the chart, this plot is from the countershaft second speed gear, the material used in this test was from S.A.E. No. 2,345, having a hardness of 70, scleroscope. The gear was 6-8 pitch and 20 deg. pressure angle, having 22 teeth and was cut by our cutter No. 29. The tooth had a $\frac{3}{8}$-in. width of face in contact at the pitch line. The analysis given with limits is the standard specification for the material used, the values in parenthesis are the values by actual analysis of this gear. The heat-treatment given this set of test gears was a heat to 1,380 deg. F., followed by quenching in oil and drawing in oil at 400 deg. for 20 min. The speed reductions are: From the main drive gear to the countershaft drive gear, having 15 and 27 teeth respectively (27:15 or 1.8:1), the countershaft second speed gear to the second speed sliding gear, having 22 and 20 teeth respectively (20:22 or 1:1.1), making a total reduction of 1.636:1. A 50-hp. load was applied to the transmission by the motor dynamometer (175 ft.-lb. torque at 1,500 r.p.m.) continuously for 6 hours.

At such a motor speed 175 ft.-lb. represents an overload for this particular set of gears quite beyond anything to which they would be subjected in actual service. Preliminary runs demonstrated, however, that some such overload was necessary if we were going to have any measurable amount of wear in a test of reasonable length of time. The six-hour test would represent, in a car having 32-in. wheels and 4¼ to 1 axle ratio, running in intermediate at a speed of 19 miles per hour for a total distance of 114 miles. The transmission lubricant used was an oil designated as No. 1, heavy.

The test was conducted by holding the power output (speed and torque) of the motor dynamometer constant for the six hours, readings being taken of oil temperature, mechanical efficiency and room temperature at one-minute intervals for the first five minutes, the same readings taken ten minutes after the start of the test and by ten-minute intervals thereafter till the end of the test. The same amount of new lubricant was placed in each transmission when set up for test and not changed during the test.







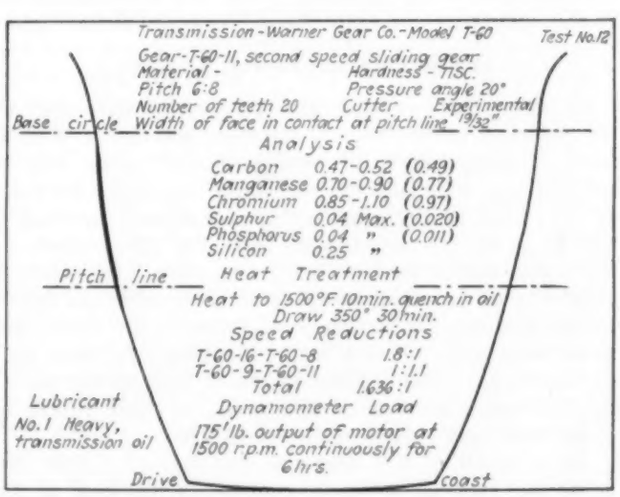


FIG. 5. EFFECT OF PROPER TOOTH FORMS

Fig. 3 represents two tests showing the best and worst conditions of wear on the oil-treated gears tested. You will note that they are both of S.A.E. No. 2,345 steel heat-treated in the same manner and cut by the

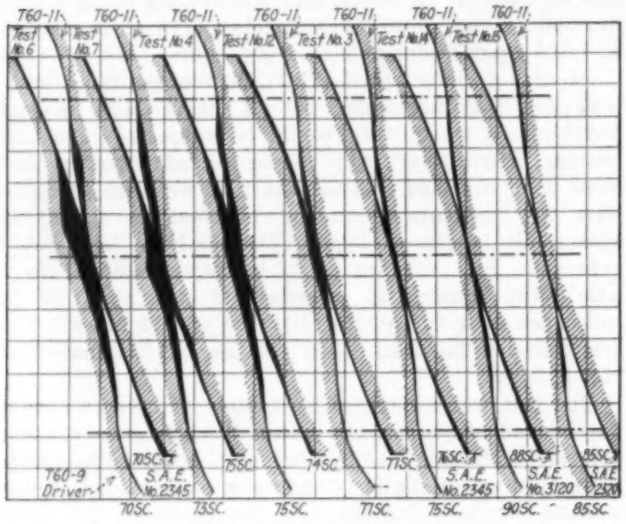


FIG. 6. EFFECT OF HARDNESS ON WEAR

same cutters, but test No. 6 (shown at the left) has a scleroscope hardness of 70 on both gears, while test No. 3 (shown at the right) has a scleroscope hardness of 75 on the countershaft gear and 76 on the sliding gear. Note the variation in the analyses of these gears, also the relation existing between the carbon content and the amount of wear. In the latter connection the wear is greatest upon the driving gears, even though it may contain slightly greater carbon. This is a condition which we would expect when the action of the gears under load is analyzed.

If the gear action were ideal, the two gears would have no backlash and any movement of the driving gear would have a corresponding movement of the driven gear. In gears as cut, there is a certain amount of backlash to accommodate lubrication, slight inaccuracies in the cutting of the teeth and warpage from heat-treatment. Any increase of backlash due to wear permits an uneven or slightly intermittent velocity to exist, which once started, rapidly destroys the contour of the tooth. This action is more rapid upon the driving gear due to its having to absorb variations in load and velocities resulting from the breaking down of the curvatures of both the driving and driven gear.

Importance of Proper Cutters

In order that we may get a representative test of the wearing properties of the steel and not a premature breaking down of the tooth curvature due to intermittent velocities or interferences, great care must be exercised in the selection of the cutters used upon the gears to be tested, also upon the other gears in the train under load at the same time. In order to eliminate all possible variation of the load being transmitted through the first pair of gears in the train, new gears were used for each test. The heat-treatment used on these gears was limited to either that recommended by the manufacturer of the steel, or that found by experience best suited to the steels used.

As a result of 325 separate analyses of S.A.E. No. 2,345 we secured a fairly representative idea of the average analysis of the steel with regard to carbon, manganese and nickel. We found that the carbon averaged between 0.43 to 0.47, the manganese from 0.56 to 0.68, and the nickel from 3.36 to 3.50 per cent. The S.A.E. limits are so wide upon this steel that it is difficult to get uniform structure from a common heat-treatment in quantity production.

In Fig. 4 is given the analysis of the S.A.E. No. 2,345 steels used in tests Nos. 6 and 3, as shown in Fig. 3. The average analysis is shown as the shaded portion between the dotted lines. The gears of test No. 3, which had the least amount of wear and the higher hardness show a higher carbon content, a higher average manganese and about the same average nickel as compared with the gears of test No. 6, which were more worn and softer. This will also be explained in a measure by the difference in the structure. The presence of more troostite in the gears having the low carbon may be accounted for by considering that when a heat is used that is correct for the steel having the higher carbon, it is not high enough for the one having the low-carbon content.

In the tests shown in Fig. 5, the gears are of the same material and have a difference of only three points in hardness. Here is very clearly illustrated the point mentioned before in the importance of using gears cut with cutters having as nearly correct outline as possible. The gears of test No. 10 were cut with the same cutters as were used upon the gears of tests Nos. 6 and 3, but from the time that the gears were cut for these tests until used for test No. 10, the cutter used upon the countershaft gear had cut 240 gears and had been ground eight times. The cutter used in cutting the second speed sliding gear had cut 142 gears and had been ground five times. This change in the cutter gave an interference which was noted before the gears were tested. When this condition had been removed by getting the proper curvature, the steel showed up very well, as will be noted by test No. 12.

Effect of Hardness on Wear

In Fig. 6 is shown an assembly of the driving and driven profiles of seven tests ranging from the condition of the most wear as shown by test No. 6 at the left, to the condition of minimum wear as shown by test No. 15. The driving gear is the one at the lower left of each combination. Here we may get some idea of the relation of the wear as compared to hardness, as well as the action of the wear and the different steps in its progress. You will note the small worn portion of the driving gear of test No. 15 at approximately 0.040 in. above the base circle and also the worn portion near the top of the tooth and the conditions in tests No. 12, No. 3, No. 7 and No. 6, as this action has progressed. The destructive action having moved from slightly above the base circle up toward the top of the tooth. When once this action has set in upon the faces of a gear, it progressively grows in intensity.

The tests of oil temperatures, mechanical efficiencies and room temperatures were also of interest. At the start of the tests the oil temperatures and room temperatures were the same and ranged from 60 to 80 deg. F. The oil temperature rose very rapidly for the first hour and had practically become constant at the end of two hours, the maximum conditions for oil temperatures on a test (not shown) was 370 deg. F. The mechanical efficiencies started with an average of 96 per cent and had practically become constant at the end of an hour. The average maximum efficiencies for the

tests shown were 98.7 per cent with a maximum of 98.9 per cent. This is a power loss of 1.1 per cent or 0.55 hp. for a 50-hp. load on this transmission. Properly constructed and properly lubricated, the automobile transmission is a very efficient unit.

The mechanical efficiencies had a gradual rise and a falling off shortly before the end of the test where the wear had been very great, but did not give any marked indication of the wear as is shown by the rise in oil temperatures which were practically without exception in proportion to the amount of wear as shown when indicated and plotted.

Considering that at this speed the tooth picks up its load more in the nature of an impact blow, especially when the tooth becomes slightly worn, we have another interpretation of the tests in the order the load is transmitted to each gear of the train as follows:

Order of gear in train	Number of teeth in gear	Speed in r.p.m.	Pitch line velocity, ft. per minute	Load at pitch line, lb.	Load in lb. per inch of face (assuming 9/16 in. face)	Total number of impacts on each tooth
1	15	1,500	982	1,680	2,986.66	540,000
2	27	833.3	982	1,680	2,986.66	300,000
3	22	833.3	800	2,063	3,667.55	300,000
4	20	917	800	2,063	3,667.55	330,120

From a careful study of the figures and curves, which are representative of the tests we are making on steels for gears, we would recommend for oil-treating steel that it possess a minimum analysis of 0.45 per cent carbon; be capable of treating to obtain a scleroscope hardness of 75 or over without brittleness; that it be as clean as it is commercially practical to make it, and that the specification limits of the analysis be of close enough range to insure uniform results from a standard heat-treatment.

Letters from Practical Men

BY F. P. TERRY

The accompanying letter is from an old reader and contributor in Belfast, Ireland. He has stated the case clearly; the AMERICAN MACHINIST does want letters from practical men—not pipe dreams or pot boilers—but honest-to-goodness experiences of men who have done some unusual job, or a usual job in an out-of-the-usual way. We hope Mr. Terry's experience as given below will inspire others to follow his example. [Editor.]

On the editor's page of the AMERICAN MACHINIST (444, Vol. 55) it was stated in connection with the contributions under the above heading, "If they do not measure up to your standards, why not send in what you consider good ones?"

After reading these letters, I am fully satisfied that they are good, and I think that what the editor is getting at and what some of us want, is more of them.

During the twenty-five years that I have been a reader of the AMERICAN MACHINIST, I have always enjoyed the letters from practical men, more so, of course, if a contribution of mine appeared therein, and I have often thought that these letters would, like Tennyson's "Brook," "go on forever" without becoming stale or uninteresting and that the practical machine shop man would always insure a busy time for the editor in making a selection. If the opposite is the case now, it is greatly to the discredit of the practical man and is very difficult to explain.

Perhaps some are keeping their ideas to themselves with the notion that they are so much wiser than the rest of the machine shop world. Sometimes this is better known as "swelled head," and if any reader has symptoms of this complaint, there is nothing better than trying to write letters for the practical column to reduce his head to normal. With this type of reader there is every chance of a complete recovery if the course is once started, but there is very little hope for another type known as the "grab-all." He is easily recognized by the shifty eyes that look at you always with suspicion that you are robbing him, or going to, at the first chance. He reads all he can but never tells you about it because he is afraid you might get a little information, which, like everything else he has, is never given away. This type is hopeless and can be left to go down unhonored and unsung.

There is yet another type with which we can all sympathize and offer encouragement. I refer to the practical man who fears to put his ideas into print. His modesty is often his undoing in the machine shop. He sees others going ahead, while he remains in the same old groove, and he is put down as lacking initiative when it is only shyness, which, if overcome, would change his whole outlook in life. To this type I would also advise the writing of letters on practical subjects.

ALWAYS A PLACE FOR IDEAS

Many men are convinced that their contributions will be refused because they are poor draftsmen and scholars, and, if they got anything published, it would only show up their shortcomings. This is an entirely erroneous idea. The AMERICAN MACHINIST never will let you down or show you up, and, although all editors like nice things, it does not matter how rough the case if the "goods" are inside, and hundreds of men can testify that this interesting hobby has made them better writers and better draftsmen, has assisted them to better positions and improved their standing in many ways and last, but not least, has put many dollars into their pockets.

Perhaps my own case may start some faltering brother along this interesting road. My first contribution brought in one dollar. The small sketch took me several hours, as I was a poor draftsman. Today I could make a better freehand sketch which would take about five minutes. I can also do a bit at the board, the desire to be able to draw having been created by the AMERICAN MACHINIST. Thanks also to the same source, I got the desire to possess and read all the histories I could get about old engineers and old tools, and today I have a bookcase fairly complete which has brought me more than twenty times the cost. Since my first attempt at writing when I was a young journeyman, I have passed through all stages in machine shop control up to getting a business of my own. During this time I have kept on writing, and for several years the AMERICAN MACHINIST'S monthly check arrived as regularly as my salary. A few photographs and one evening's work brought me in fifty dollars; I have also made friends all over the world.

There is no reason why any reader should not do the same. Why not start now?

Eliminating the Hit and Miss Method of Hiring Men

BY F. T. MACFEELY

There was a time when the first man who came along got the open job, providing he wasn't totally blind or a hopeless cripple. It made no difference whether or not the applicant was fitted for the work for which he was employed; if the first impression was favorable to the superintendent or foreman who did the hiring, the man was set at work without further ceremony. This method of hiring men is no longer used at our plant, but has been discarded for a better one. Now each man is interviewed thoroughly, to determine his qualifications and to fit the right man to the right job.

This is accomplished through job specifications. The form shown here is the one we use. There are others which are no doubt just as good, but this one fits our requirements better than any others we have tried.

As will be seen, it is divided into five sections, one giving general information, the second stating the requirements of the worker, third the physical aspects of the job, while the last two are left blank for the convenience of the interviewer.

The blank forms are applicable to all departments of our factory. They are completed in accordance with the form, shown herewith, from information obtained at a conference between the interviewer, the superintendents and the foremen. First, the foreman and the interviewer get together and decide on the requirements and qualifications for each occupation in the department, after which a copy is sent to the division superintendent for his approval. If he takes exception to any items, he calls in the foreman and interviewer for a consultation.

It is no easy matter to get one of these forms properly filled in, as the wide difference of opinion as to the requirements for some occupations necessitate much thought and study. The foreman and interviewer may agree on certain qualifications, but the superintendent's ideas may be quite different. The job specifications are worthless without the positive agreement of all three persons concerned, but when they are once completed satisfactorily they are worth many times the trouble and expense involved.

We have found these job specifications, or "hiring specifications," as they might be called in our case, among the most valuable records we have in our employment department.

JOB SPECIFICATION

General Information:

Occupation *Engine Lathe Operator* Dept. *Machine*
Duties *Machine Brass, Mall. and Iron Castings on Engine Lathe*
Tools Required *See attached list*
Furnished by Company *Attached list* By Employee *Attached list*
Experience Necessary *Drill and Turret Lathe* How Long to Learn *1 Year*
Start Rate *M F* Max. Rate *CFX* Promote from *Turret Lathe* To *Tool Lathe*
Day Work × Piece Work Bonus Combination

Requirements of Worker:

Man ×	Age Limits Desired 20–40	Set up Work ×	Quick
Boy	Age Limit Acceptable 20–50	Read Scales ×	Deliberate ×
Tall	Weight—Maximum	Use Jigs	Patient ×
Medium	Weight—Minimum	Use Templates	Careful ×
Short	Read Micrometer ×	Use Gauges ×	Thorough
Strong	Read Blue Prints ×	School Grade 8	Accurate ×

Physical Aspects of Job:

Hand Lift ×	Standing ×	Floor	Dusty	Wet
Crane Lift	Sitting	Bench	Noisy	Dry ×
Medium Hvy.	Stooping	Heavy	Acids	Hot
Variety	Walking	Light ×	Fumes	Cold
Repetition ×	Exacting	Close ×	Quiet	
Monotonous	Indoor ×	Rough	Alone	
Machine ×	Outdoor	Dirty *Some*	Pairs	
Pleasant ×	Greasy	Clean	Group	

Questions to Ask:

Can you cut threads without reverse belt or dial in carriage?
How would you bore a taper hole without taper attachment on lathe?

Remarks:

If possible, employ a young man for this position, one who is ambitious, as the opportunity for advancement is good.

Selling a New Gage to a Competitor

BY FRANK C. HUDSON

It always pays to know your competitors and your competitors' friends.

One day in the early stages of our business we got an order from the Blank Company for one of our special gages which we had just announced. The first thing which aroused our suspicions was that it was a carte blanche order with no query as to price. Now this company had always been a very close buyer, with an emphasis on the "close." Furthermore, we knew that it was having a hard time to keep the sheriff's sign off the door, so that an order of this kind set us to thinking.

Then we saw the light.

Our worst competitor, not in real competition but worst in the worst way you can use the word, was a personal friend of the grand mogul of the Blank Company. So we knew at once why the gage was ordered. The Grabem Company wanted a chance to take one apart and copy it as nearly as possible in order to compete in bidding for a big order which had loomed in sight.

Did we refuse to supply the gage? We did not. We thanked the company for the order and proceeded to make a good instrument in every way. It would function properly and to all appearances was like our regular product. But it wasn't. It would do all the name implied but it lacked a couple of features which we knew would be specified in the order and was not like our regular product in many ways. The rest is easy to guess. The Grabem Company copied our instrument, as usual, spent some of their good money on tools and submitted an instrument which did not meet specifications.

We got the order. If we had sent one of our regular gages there's no telling what might have happened.

As I remarked before, it pays to know your competitors and who your competitors' particular friends are.

Automotive Service Methods and Equipment

VIII. Some Operations in a Standard Oil Company Service Plant—Ford Rear-Axle Tools —Turning Crankpins—Grinding Cylinders in a Lathe

By HOWARD CAMPBELL
Western Editor, American Machinist

SOME of the tools in use at the Chicago service plant of the Standard Oil Co., at 14th and Leavitt Sts., will undoubtedly be interesting to those engaged in work of a similar nature.

The operator shown in Fig. 1 is removing an axle housing cap from a Ford rear axle. The method of

FIG. 1. PULLING OFF A FORD AXLE HOUSING CAP

using the puller can be seen at a glance, while the details of the tool used are shown at *A* in Fig. 3. The wheel is removed from the axle as shown in Fig. 1, and the puller applied over the cap. Then the screw *C* is turned, shoving the key *D*, which has a slight lip at the end, in through a slot so that the lip catches over the inner end of the cap. Then the crank *E* is turned, the screw of which it is a part feeding in against the end of the axle shaft, thus drawing the body of the tool, with the axle housing cap, off the shaft.

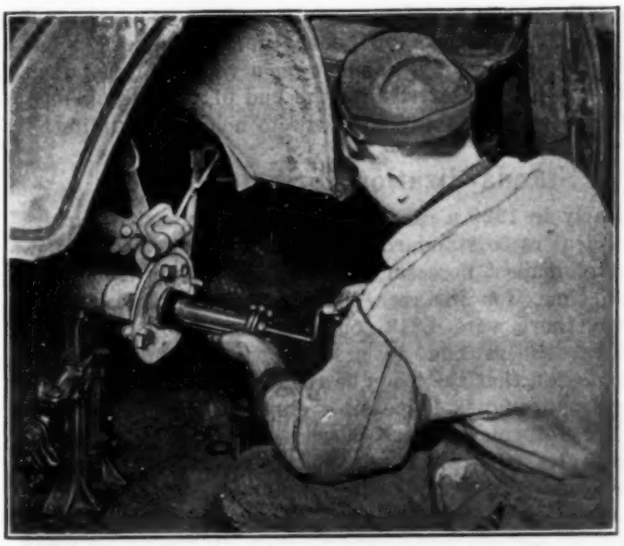


FIG. 2. PULLING THE ROLLER BEARING SLEEVE FROM A FORD REAR AXLE

In Fig. 2 is shown how a roller-bearing sleeve puller is applied. This tool, which is shown at *B* in Fig. 3, is inserted into the axle housing, and slips into the roller bearing sleeve. The pin *F* which is operated by the handle *G*, is connected to the pin *H* through an eccentric so that when the handle is turned, the pin can be made to recede until it is flush with the outside diameter of the tool, or it can be made to protrude.

There is a hole in the roller bearing sleeve through which grease is fed to the roller bearing. When the sleeve puller is in place, the handle is turned so that the pin protrudes, and the tool is turned until the pin slips into the grease cup hole. Then the sleeve can be removed from the housing by turning the crank *I*, which feeds a screw against the end of the axle shaft.

The test fixture shown in Fig. 4 is of simple design, but does the work required of it very nicely. The pin *A*, which is the exact size of a Ford crankshaft, is slipped through the large end of a connecting rod, as shown. Pin *B* which is the size that a piston pin should be, is inserted in the small end of the rod. When the rod is in the position shown, if a heavier feeler can be slipped under one end of the pin than under the other end, it is obvious that the piston-pin hole is not parallel with the crankshaft hole. To test the rod for twist, it is simply swung over until the pin rests

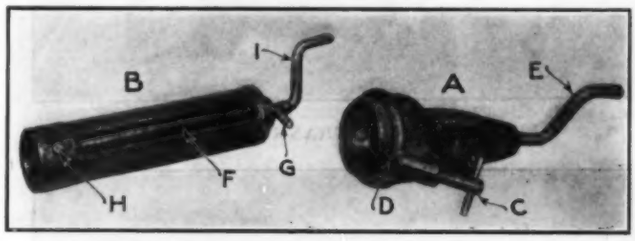


FIG. 3. AXLE HOUSING CAP PULLER AND ROLLER BEARING SLEEVE PULLER

on the blocks indicated at *C*. Any twist can be detected immediately by the use of the feeler gage.

A pair of clamps which make it possible to turn the throws on any crankshaft is shown at *A* and *B* in Fig. 5. The hole in the clamp is large enough to receive the end of the shaft, which is held in place by the setscrew *C*, as shown. The centers of the lathe fit into the sliding blocks, one of which is shown at *D*. This block is turned and threaded on the end opposite the center hole, to receive nut *E*, which is screwed down to hold the block in place.

The blocks are set as nearly in line with the pins to be turned as possible, before the shaft is put into the lathe. Then an indicator is used to finish the job of lining up, the blocks being adjusted until the pin is running true, after which the turning can be done.

To obtain the best results in working on crankshaft pins, a counterweight should be used as shown at *F*. Otherwise the weight of the shaft itself will spring it "out of true" as it turns.

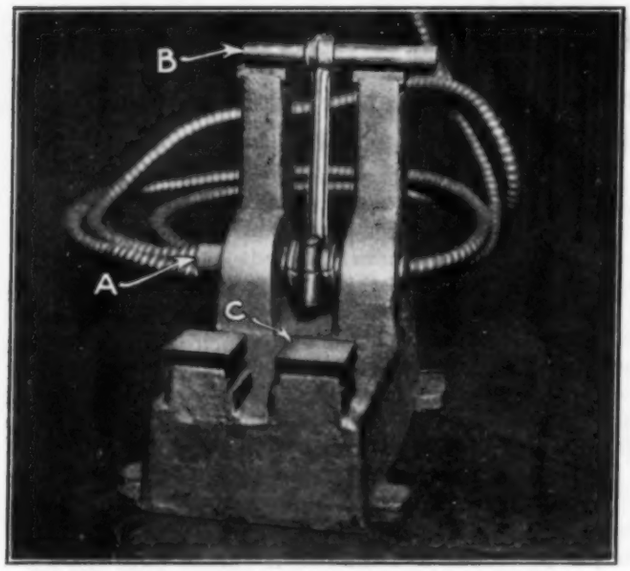


FIG. 4. FIXTURE FOR TESTING STRAIGHTNESS OF CONNECTING RODS

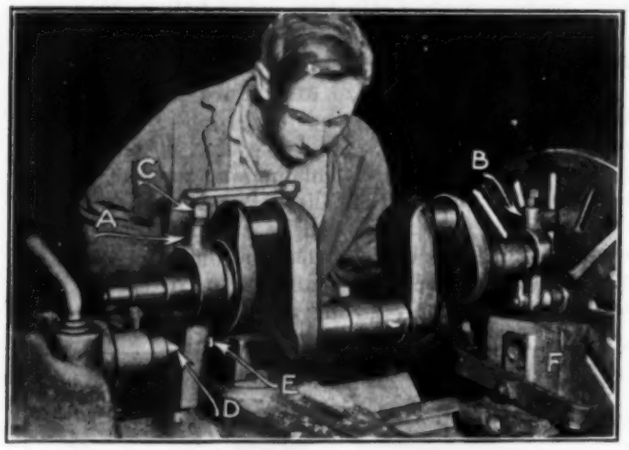


FIG. 5. TURNING CRANKSHAFT PINS

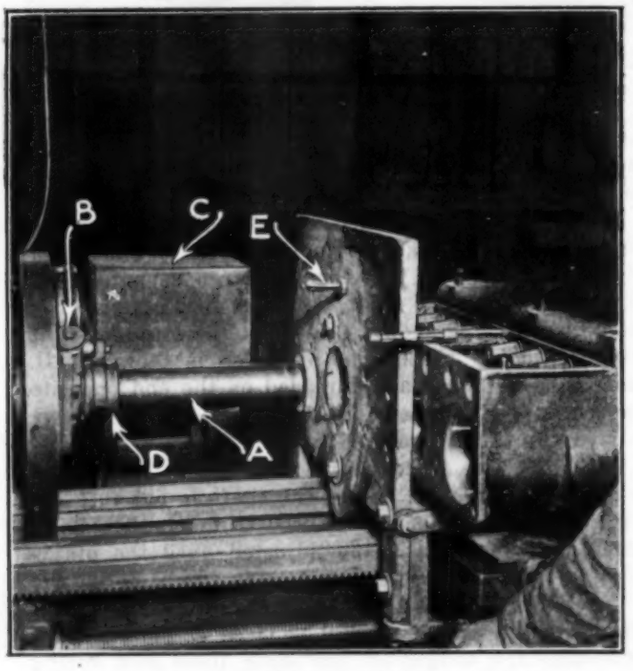


FIG. 6. GRINDING CYLINDER BORES ON A LATHE

The operation of grinding cylinder bores on a lathe that has been converted into a cylinder grinder is shown in Fig. 6. The grinding attachment, as can be seen, is bolted to the faceplate. The sleeve *A*, to which the wheel is attached, runs on ball bearings on a shaft which is attached to a sliding head. This head is dove-tailed and gibbed into the plate that is bolted to the faceplate of the macihne. The shaft can be adjusted to the amount of eccentricity required by means of the screw *B*. Power is supplied through a 1 hp. motor which is covered by the box *C*, by belt to the pulley *D*, which is a part of the spindle. The wheel is a "grade 46," furnished by the Heald Grinder Co. expressly for cylinder grinding.

The speed of the faceplate is about 15 r.p.m., and that of the wheel is about 4,000 r.p.m. This spindle is furnished by the Acme Grinder Co., Minneapolis, Minn.

The cylinder is bolted to the angle plate which in turn is bolted to the cross-slide of the machine, and the bore is indicated until it is straight and true with the spindle. Then the operator proceeds as with any other cylinder grinder.

A small ring bolt is screwed into the faceplate at *E*, which is used to hold the wheel dresser. The hole in the bolt is just large enough to receive the dresser, and the small screw which can be seen in the picture holds the dresser in position.

An efficient, though simple, tool is shown in Fig. 7.

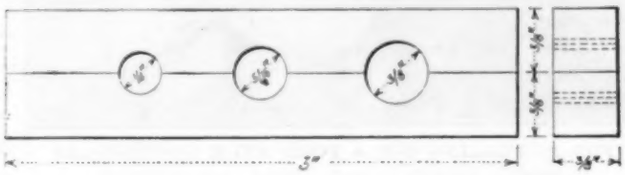


FIG. 7. TOOL FOR FLANGING COPPER TUBING

This is composed of two straight pieces of $\frac{3}{8}$-in. square cold-drawn steel, with three holes drilled in the two pieces as shown, so that each piece contains only one-half of each hole. The holes are $\frac{1}{4}$ in., $\frac{5}{16}$ in. and $\frac{3}{8}$ in.

When it is desired to put a union or coupling on one end of a piece of copper tubing, the coupling is slipped over the end of the tubing, then the end of the tubing is caught between these two pieces of steel, the size of the tubing determining the size of the hole to be used. Then the pieces are clamped into a vise so that the end of the tubing sticks up above the steel blocks about $\frac{1}{4}$ in. One blow of a hammer on a round nosed punch that has been inserted into the end of the tubing puts a flange on the tubing sufficient to hold the coupling.

Standardization of Shotgun Shells

Early in 1920 a campaign was launched with jobbers and dealers to standardize on and restrict their orders to the smallest necessary number of shotgun loads. At that time, for instance, in 12 Gage smokeless loads alone, there were 4,213 combinations.

The jobbers and dealers responded readily to the suggestion that the loads be reduced to a common sense basis and suggested possible eliminations.

The information was passed on to the ammunition companies with the result that in the 12 Gage smokeless loads 85 per cent were eliminated and 72 per cent of the black powder 12 Gage loads were eliminated. The same proportion holds good all through the list of loads in all gages.

Shafts Weakened by Grinding Cracks

By K. Heindlhofer

Causes which appear insignificant and escape general attention oftentimes produce serious results. This is illustrated by an experience on hardened and ground shafts, two of which broke in succession at a load considered to be within the safe limit. Due to the fact that the acting forces and running conditions were well defined and known, a record of this incident may be of interest to both the shop and engineers.

The shafts which broke were made of a 1 per cent carbon, 1.5 per cent chrome steel of high quality. They were heat-treated, which resulted in a hardness of 600 Brinell. The shafts were ground to the dimensions shown in Fig. 1 and carried four ball bearings equally spaced at a distance of 3.8 in. The two inner bearings carried a vertical load of 4,550 lb. each. Practically no torque was transmitted. Due to the equal spacing the outer bearings furnished an identical reaction load. The maximum stress due to bending was 31,800 lb. per square inch. The speed of rotation was 1,450 r.p.m. A revolution counter indicated the total revolutions of the shaft.

The first shaft broke after 195,000 revolutions or 2¼ hr. A second shaft, which was made exactly the same as the first, met the same fate after 10,000 revolutions or less than 7 min. This was a surprise, as smaller size shafts under similar stresses, had given continuous service.

After the second shaft broke both failures were closely investigated. The investigation revealed the presence of grinding stresses and cracks, due to excessive pressure of the wheel when grinding the shaft. In both cases the fracture started at the defective surface. The pressure of grinding was caused by a hump in the shafts, which were warped in quenching. Fig. 2 is a photographic reproduction of the cracks in both

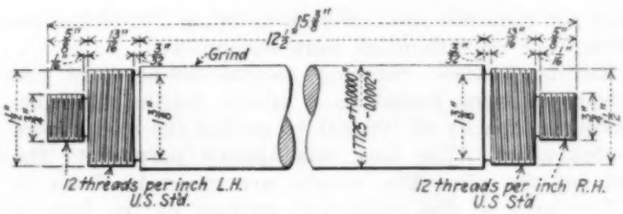


FIG. 1. DIMENSIONS OF THE SHAFT

shafts. The cracks were rendered visible by deep etching in boiling 50 per cent hydrochloric acid.

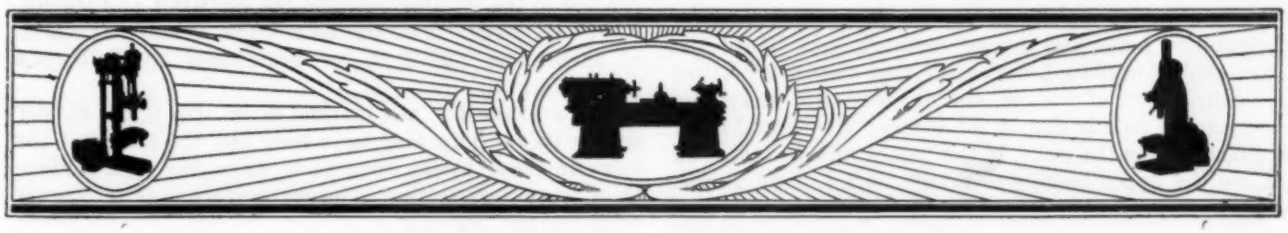
The third shaft, which was identical in dimensions, material, and heat-treatment, with its foregoers, was ground with care under small wheel pressure. It was then put in service and has made 57,484,000 revolutions, which corresponds to a 660 hr. run. It is still in perfect condition, in spite of the fact that it ran under the same load and speed as the first two.

The great difference in life of the shafts, caused by improper and proper grinding, shows the evil effect of forced grinding. The forced grinding may render the piece useless, which fact may easily escape inspection, because even hair cracks are generally invisible to the eye.

To explain the failures recorded above, let me call attention to the behavior of a thick glass, into which hot water is suddenly poured. One would not be surprised to see the glass cracked after this experiment. Something similar happens in forced grinding. A hard wheel at excessive pressure will produce an instanta-

FIG. 2. THE CRACKS IN BOTH SHAFTS

neous local heating on the wheel. The locally heated area will expand and produce stresses. In addition to the heat effect at high wheel pressure, considerable friction is created between the work and wheel which transmits tangential forces between the two. These forces act on a very small area, thus the unit tangential or shearing stress may reach a considerable magnitude. A combination of the heat and frictional stresses is, in all probability, responsible for the cracks. These cracks, if on the surface, are not very dangerous at steady load. Assume the shaft was not rotating but subjected to a constant load, no fracture would have occurred. It was stated above that the shaft broke after a certain length of time (2¼ hr. in the first, and 7 min. in the second case). The influence of the time to produce fracture is explained by the fact that the stresses on the top, caused by the bending, are opposite in direction to those on the bottom of the shaft. After each half revolution the compression and tension stresses reverse; thus at each revolution two reversals take place. It is a well known fact that alternating stresses cause fracture in the material even below the elastic limit. In this case no appreciable permanent deformation will occur, thus the local high stresses at the ends of cracks will not be reduced by permanent stretch such as would be the case on a still-standing shaft. Therefore, fracture will start at the cracks as soon as the metal is fatigued at these severely stressed points.



Experimental Use of Liquid Air and Explosives for Tightening Body-Bound Bolts

Cylindrical and Taper Bolts Contracted by Liquid Air and Allowed To Expand After Insertion—Cylindrical Bolts Expanded in Place by Explosives

By H. L. WHITTEMORE
U. S. Bureau of Standards, Washington, D. C.

BODY-bound bolts are used in the Navy for attaching the lugs of turret guns to the supporting girder, and for other purposes. Taper bolts have been successfully used, but other possible means of securing the same results were made the subject of investigation and experiment.

The experiments described in this report, undertaken at the request of the Bureau of Construction and Repair, Navy Department, were made to determine the force required to cause slipping of a body-bound bolt. Two methods of obtaining a metal contact between a bolt and the material surronunding it were used.

Tests were made on bolts which had been body-bound by the following methods: (1) Liquid air, shrinking the bolt by immersing in liquid air and allowing it to expand in the hole; (2) explosives, inserting the bolt which was a loose fit in the hole and expanding it by an explosive charge placed in a small hole in the axis of the bolt.

Liquid Air Tests on Cylindrical Specimens

Theory: The boiling temperature of liquid air is about —190 deg. C. (—310 deg. F.) and room temperature is about 20 deg. C. (68 deg. F.). It seems that a temperature range in the bolt of about 200 deg. C. can be obtained. The co-efficient of linear expansion for steel is at least 0.000010 in. per deg. C., at normal temperature, although this value may not be correct at very low temperature. For the temperature range available, the change in dimensions will be about 0.0020 in. per inch. It seems, therefore, that a bolt or pin 1 in. in diameter would become 0.002 in. smaller (0.998 in. in diameter) if immersed in liquid air until it had reached the boiling temperature of the air and would return to its former diameter upon reaching room temperature.

Specimens: In order to demonstrate the practicability of this method of body-binding bolts the following tests were made. Six blocks of mild steel were prepared, each 1¼ x 3 x 6 in. A hole was bored through each piece in the center of the largest face. The holes were carefully hand reamed with an expansion reamer and had a diameter of 1.0056 in.

Three machine steel pins, 3 in. long were made for the holes. The diameters were 1.0066 in., (mark 0.001), 1.0071 in., (mark 0.0015), and 1.0076 in., (mark 0.002), the "mark" is the amount that the pin diameter exceeded the diameter of the holes.

Assembling of Specimens: The pins were held by blacksmiths' tongs and dipped vertically into liquid air. When ebullition ceased, indicating that they had reached the temperature of the air, one pin was withdrawn and placed in the hole in one of the blocks; the second block was placed over the pin. If the blocks failed to meet on the pin the upper block was driven with a hand sledge.

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The pin, marked 0.001, entered the holes readily and the specimen was assembled without driving. The pin, marked 0.0015, stuck and although driven quickly only projected about ⅛ in. through the top block and lacked about ¼ in. of passing through the lower block. After entering the holes the pin was immovable in about one half minute.

TABLE I. PULL REQUIRED TO SEPARATE THE BLOCKS. (STRAIGHT PINS)

Spec. Mark	First Block To Slip	Starting Load Lb.	Slipping Load Lb.	Second Block To Slip	Starting Load Lb.	Slipping Load Lb.
0.001	bottom	6,420	5,300 to 4,000	top	9,470	6,310
0.0015	bottom	7,060	.....	top	8,080	6,700 0.12 in.-6,230 0.25 in.-6,000 0.50 in.-3,000
0.002 (0.0014)	top	8,800	6,200* 5,900* 0.02 in.-5,820 0.106 in.-5,800 0.200 in.-5,800	bottom	10,990	6,000

* After slipping started the testing machine was stopped. Slipping continued at lower loads.

As it was obviously impossible to assemble the third specimen, pin marked 0.002, it was filed down in a lathe to a diameter of 1.007 or 0.0014 in. larger than the hole.

TABLE II. UNIT FRICTIONAL RESISTANCE

Specimen Mark	Top Block Lb. per Sq.In.	Bottom Block Lb. per Sq.In.
0.001	2,410	1,635
0.0015	2,060	1,800**
0.0014	2,240	2,800

** The pin did not extend through the hole.

This pin required some driving to bring the blocks together but no difficulties were encountered.

Testing: After reaching normal temperature the specimens were loaded in a Riehle testing machine, having a capacity of 100,000 lb., so that the blocks were forced apart. The load was applied parallel to the axis of the pin. The results are given in Table I.

The area of the cylindrical surface of the hole is about 3.93 sq.in. The unit frictional resistance shown in Table II, may be found by dividing the slipping load by this area.

Examination of the pins and holes after their separation showed that the surfaces were perfectly smooth where they had been in contact. All of the holes showed some depressions below the reamed surface where the metal had been torn previous to the hand reaming operation. In general these areas did not exceed perhaps 5 per cent of the total surface.

Conclusions: These results show practically no difference in the friction between the pin 0.001 and the pin 0.0015 in. larger than the hole. The average for both of these was 1,9978 lb. or practically 2,000 lb. per square inch.

The average for pin marked 0.002 was 2,520 lb. per square inch. This may have been due the fact that the holes in these blocks apeared to have less torn surface than the others so that a larger surface was in contact with the pin.

If the pin 0.001 in. larger than the hole caused a comprehensive stress in either the pin or the block equal to the yield point of the material, as appears probable from computation, then the pin 0.0015 in. larger would not cause an appreciably higher stress. It would merely cause permanent deformation of the material in the pin or block, possibly both. The fact that the starting loads appear to be about the same for all the specimens, within the limits of the experimental errors involved, tends to show that the highest loads for these materials were reached.

Apparently by the use of liquid air, pins or bolts can readily be assembled if their diameter is larger than that of the hole by 0.001 in. for every inch of pin diameter.

Liquid Air Experiments on Taper Pins

Since in the use of liquid air on cylindrical pins difficulty was found in inserting the pins in holes after cooling, it was suggested that experiments with taper pins be made. The experiments described here were made on taper pins.

Specimens: Six pieces of mild steel 1¼ x 3 x 6 in., the same as used in the previous tests, were used for the plates in these tests. The blocks were secured in pairs and a taper hole bored through them in an engine lathe. A steel pin about 4½ in. long was turned to fit each of the three pairs of blocks.

The diameter of each pin was measured at each one-half inch along its length, and the measurements plotted to an enlarged scale. The taper was somewhat irregular but an average value was obtained from a line drawn through the points. The average values are given in Table III.

Assembling: The blocks were placed so that the holes were in line and the pins which had been cooled in liquid air were inserted in the holes and seated by a few light blows followed by one comparatively heavy blow from a hand sledge. The pins and blocks were easily and quickly assembled due to the taper of the holes.

Testing: After attaining room temperature the blocks were separated in a Riehle testing machine

TABLE III. AVERAGE TAPERS AND DIAMETERS OF PINS.

Pin No.	Taper In. per Ft.	Approximate Value	Block	Mean Diameter of Hole, In.
1	0.0535	1/16	upper	1.1593
			lower	1.1547
2	0.024	1/32	upper	1.0802
			lower	1.0776
3	0.0456	3/64	upper	1.0954
			lower	1.0903

having a capacity of 50,000 lb. The load was so applied as to cause slipping of the pin in one block at a time, except for No. 3. This was loaded so as to force the

TABLE IV. PULL REQUIRED TO SEPARATE THE BLOCKS (TAPER PINS)

Block No.	Area of Contact Sq.In.	Amount of Shrinkage In Diam. In.	Starting Load Lb.	Unit Frictional Resistance Lb. Sq.In.
1 upper	4.55	0.0024	14,300	3,140
1 lower	4.53	0.0022	12,400	2,740
Average	4.54	0.0023		2,940
2 upper	4.24	0.0022	13,100	3,090
2 lower	4.23	0.0016	10,800	2,550
Average	4.23	0.0019		2,820
3 upper / lower	8.53	0.0024	27,000	3,240

pin out of both blocks at the same time, slipping occurring in each simultaneously.

Results: The results of the test are given in Table IV. The values reported for the unit frictional resistance are obtained by dividing the starting load by the area of contact between the block and pin. The starting load was the maximum load, the slipping load being considerably lower and rapidly falling to zero. The amount of shrinkage in diameter of the pins included in the table, was determined from the change of the position of the plates on the pins, after the pins had been contracted by liquid air. The values are based on the assumption that all the deformation took place in the pin.

A comparison of the results obtained with cylindrical and taper pins shows that the average unit frictional resistance is about 40 per cent higher for the taper pins than for the cylindrical ones. The table shows that the value of the unit frictional resistance is dependent upon the relative shrinkage of the pin to the plate and is approximately proportional to the amount of shrinkage. The load necessary to force pin No. 3 out of the two blocks is approximately twice the load necessary to

TABLE V. SIZES OF BOLTS AND CHARGES OF EXPLOSIVE

Bolt	Diam. Bolt Hole In.	Outside Diam. In.	Plate Hole Dia. In.	Detonator	Charge	Computed Pressure Lb. per Sq. In.
2	0.502	1.250	1.264	15 grains	10 grams	125,000
3	0.502	1.250	1.264	15 grains	8.5 grams	107,000
5	0.381	1.248	1.264	15 grains	5 grams	125,000
6	0.384	1.250	1.264	35 grains	none	25,000
4	0.632	1.250	1.252 –1.309	15 grains	5 grams	37,500
1	0.637	1.250	1.277 –1.310	15 grains	7 grams	51,000

force the other pins out of each block, since the area of contact is about double. The results are in close agreement with the experimental data upon the slipping loads for shrink and force fits, published in the American Machinist, Feb. 16, 1899, by John H. Wilmore.

Test of Body-Bound Bolts Expanded by Explosive Charge

In order to determine the effect of expanding the bolts by means of high explosives, two sets of plates with six

TABLE VI SLIPPING LOADS

Bolt No.	Load in Pounds for Different Amounts of Slip 0.05 Inch	¼ Inch	½ Inch	¾ Inch	1 Inch	1½ Inch	3 Inch	Through Top Plate	Maximum Load Lb.
1	22,000	27,500	26,700	25,000	24,000	.....	.....	7,000	27,500
3	29,600	28,000	29,600	29,200	27,200	24,000	19,300	23,000	29,600
5	23,000	20,000	21,700	21,000	18,000	10,000	7,000	600	23,000
6	4,250	1,700	1,000	.....	.....	.....	.....	.....	4,250

1¼-in. bolts were submitted for test and examination. The thickness of the plates submitted was 1⅞ in. One set of plates contained bolts Nos. 2, 3, 4, 5 and 6, and the other set contained bolt No. 1. Bolts Nos. 2 and 3 were driven about ⅛ in. out of the plates, and the threaded portion carried away due to the method of firing as described in the report of the Naval Proving Grounds. The size of the bolts, and the charges used are given in Table V.

Bolt No. 6 fired with detonator alone was the only one that could be moved after testing as none of the others could be turned with a 24-in. wrench.

Testing: Bolts Nos. 1, 3, 5 and 6 were tested in a 50,000-lb. Riehle testing machine. The amount of slip was measured and the corresponding load necessary to force the bolt out of plates was observed.

Results: The slipping loads for different amounts of slip are given in Table VI.

It will be seen that the starting load was not necessarily the maximum load. In fact, for some of the bolts, the maximum load was not reached until the bolt had slipped from ¼ to ½ in. For all the bolts tested except No. 6, which was not expanded sufficiently, a load near the maximum was necessary to produce a slipping of 1 in. or more.

In Table VII the charge and pressure used in expanding the bolt, the maximum slipping load and unit frictional resistance are given. The percentage of metal of the bolt remaining after drilling the hole for the charge is also given.

After the bolts had been forced out of the plates, the surfaces of both the bolts and holes were examined to determine if the bolts had been in contact with the holes.

TABLE VII. CHARGES AND PRESSURES IN EXPANDING, SLIPPING LOADS AND UNIT FRICTIONAL RESISTANCE

Bolt No.	Diameter of Hole in Bolt	Detonator Charge	Charge	Pressure	Maximum Slipping Load	Unit Frictional Resistance	Amount of Metal of Bolt Remaining After Drilling Hole
	Inch	Grains	Grams	Lb. Sq.In.	Lb.	Lb. Sq.In.	Per Cent
1	0.637	15	7	51,000	27,500	2,240	75.0
3	0.502	15	8.5	107,000	29,600	2,410	84.0
5	0.381	15	5	125,000	23,000	1,880	91.0
6	0.384	35	none	25,000	4,250	350	91.0

For bolts Nos. 3 and 5, surfaces appeared to have been in good contact while bolt No. 1 showed only about four-fifths of the surface in contact. Bolt No. 5 showed only about one-twentieth of the surface in contact near the head end.

Conclusions: The results of the test show that with the use of liquid air, a tighter fit can be obtained with a tapered bolt than with a cylindrical one. The average unit frictional resistance of the test on cylindrical pins is 2,150 lb. per square inch while the average value for the tapered pin is 3,000 lb. per square inch.

Moreover, less difficulty was encountered in assembling the blocks with a taper pin than with a straight one.

The test of the bolts expanded by explosive charges shows that satisfactory results can be obtained by this method. The average unit frictional resistance of bolts Nos. 1, 3 and 5 was 2,120 lb. per square inch, which is the same as that developed in the experiments of shrinking cylindrical oversize pins by liquid air.

It appears from these tests that the size of the hole drilled in the bolt has a greater effect in producing a tight fit, than the pressure due to the explosive charges. A 1¼-in. bolt containing a hole larger than about ½ in. in diameter would be materially weakened, because of the reduction in cross-sectional area. It appears however, that a correct combination of the size of the hole and pressure of explosive charge, could be used to produce a very satisfactory fit without weakening the bolt more than 10 per cent.

What Is the Most Economical Belt?

BY W. F. SCHAPHORST

A belt user recently wrote to a dealer in belts and asked: "What kind of belt is the most economical in the long run?"

The dealer replied: "The belt that will transmit the most power per square foot of its area during its natural length of service is the most economical."

This answer may be correct. In fact, it is correct. But, now that the belt user has the answer what is he going to do with it? The answer is certainly a very vague one. Very likely the user knew that much about it before he asked the question. What the user wants to know is I believe: What kind of belt is the most economical in the long run—leather, cotton, rubber, camel's hair, balata, etc.?

In spite of all of the substitutes that have been manufactured, leather belting still predominates. It is the superior belting for general machine shop work. Where belts must be shifted from pulley to pulley there is nothing better. In fact where finger shifters are employed nothing but leather belts should ever be permitted. Leather belts are also superior for use on quarter turn drives, reversing drives, or wherever there is constant side pull, slipping and jerking.

The cotton belt has largely replaced the leather belt in outdoor power transmission as in connection with threshing machines. It has also largely replaced the leather belt in industries where much dirt and grit is encountered, as in cement mills, brick plants, flour mills, crushing plants, etc. It is an excellent belt for use in hot and dry places. It is very strong and durable, but must never be used in connection with finger shifters because such shifters wear the edges rapidly causing them to fray and unravel and fail prematurely.

There are a number of rubber composition belts on the market, and it is claimed by many users that these belts are superior to the leather belts, which may be true for their own conditions. It is the writer's belief that the rubber belt is superior to the leather belt for use in wet or damp places, as in paper mills, dye houses, laundries, etc. In fact, it has practically replaced the leather belt in all of these industries. Like the cotton belt, however, it must never be used in connection with finger shifters because of the fact that it has a fabric core which gives it its strength and which will cause premature failure when the edges are once worn or frayed.

The life of a belt depends largely upon the good start that it gets, in the same way that the success or failure of a man depends largely upon the care given him during his childhood. Therefore, when putting a new belt on the pulley too much care cannot be given to it to see that it is put on right. The ends should be cut square. If the joint is glued there should be no "kinkiness" in the belt.

Shafts and pulleys should be aligned as perfectly as possible so that there will be no side slipping, no forcing, no everlasting running off and no sidepull.

Occasionally there is something inherently wrong in the belt itself so that after a few days of operation it will run crooked in spite of the care first given it. This may be due to the fact that one side of the belt was stronger than the other, consequently the weaker side stretched most and as a result the belt began operating imperfectly. When this happens the belt should be taken off and the imperfection carefully removed. Unless this is done it is obvious that there will always be some side slip or side pull and the life of the belt will be materially reduced. It pays to watch new belts carefully and see that they get a proper start in life. By so doing much money will be saved.

It is impossible of course, to answer the above question completely and with absolute accuracy, but the writer feels that his reply is at least more definite and more satisfactory than the reply given by the dealer.

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Milling a Scroll

By J. A. Camm

An unusual example of milling with the machine set-up for the operation is shown in the accompanying illustrations.

The work, Fig. 1, consists of a cast-iron disk, 17 in.

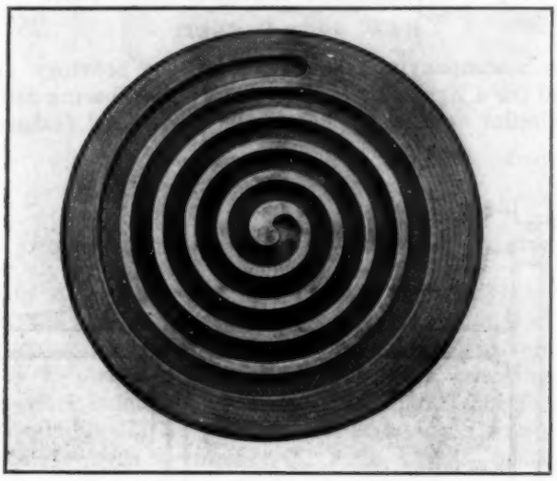


FIG. 1. THE FINISHED SCROLL

in diameter and 2 in. thick, and is used for a mold for spiral packing. The groove is 1 in. wide and 1 in. deep with a ½-in. wall making the pitch of the scroll 1½ in.

In order to secure the circular pitch of 1½ in. it was necessary to revolve the 4-pitch screw in the table of the milling machine six times to one revolution of the rotary table holding the work. This was accomplished by rigging up a standard dividing head, as shown in Fig. 2, by attaching the universal joint to the worm shaft and driving through the wormwheel to the screw by means of change gears.

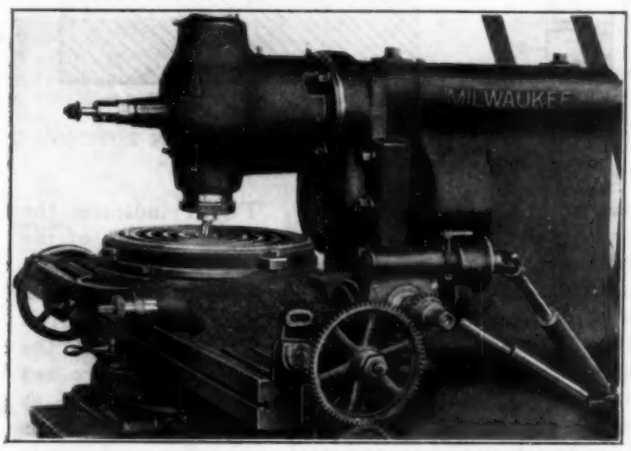


FIG. 2. MACHINE SET-UP FOR MILLING THE SCROLL

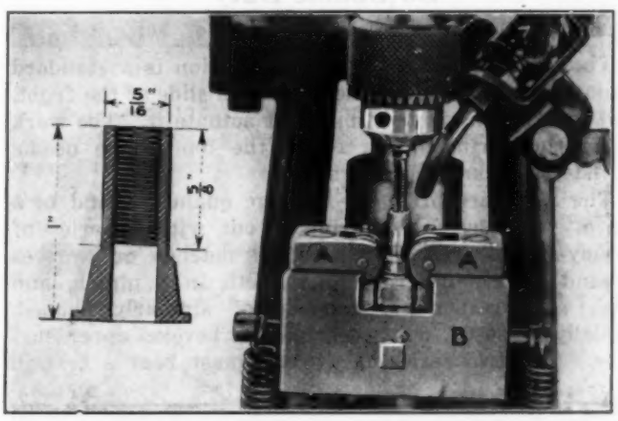
A Difficult Piece to Hold for Tapping

By Amos Ferber

Because of its thin walls and small diameter in proportion to the size of the tap, the piece shown in the illustration gave all sorts of trouble in holding it for the tapping operation. After many experiments, the device here described was made, enabling the operator to reach a production of 680 pieces an hour.

The jaws *A* are fastened to the top of the block *B* and have no movement except for purposes of adjustment. In the end of each jaw is a hardened steel roll, grooved to fit the contour of the work and serrated circumferentially with a number of sharp V-grooves like a thread without lead. Through the center of the block passes a hollow spring-operated plunger which presses the work upward, where its tapered portion enters between the rolls, the serrations of which match the corrugations of the work.

This results in an extremely strong grip on the work, without tendency to crush it, and has the further advantage of releasing quickly and cleanly. The operator has but a single lever to move and the operation of tapping is correspondingly rapid. Slippage rarely occurs.



TAPPING FIXTURE FOR THIN WALLED WORK

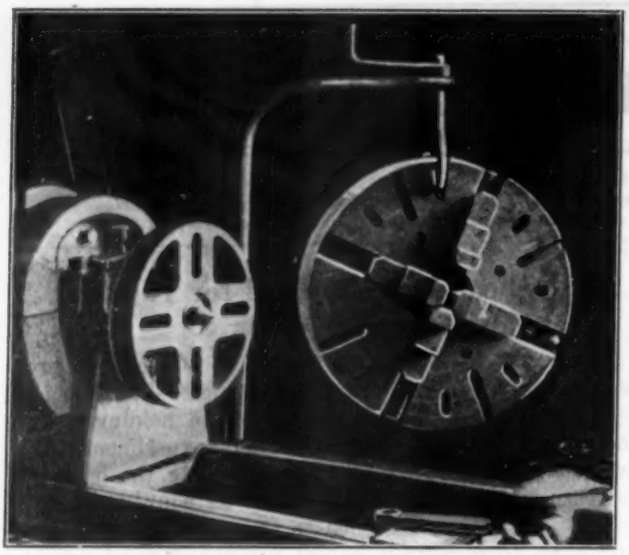
The device was designed and made by the Anderson Die Machine Co., and is used on an Anderson reversing spindle tapping machine.

Crane for Handling Lathe Chucks

By L. H. Gibbs

I am enclosing a photograph showing a very convenient time- and labor-saving lathe-chuck crane which we made and applied to our 18- and 20-in. lathes. The device is so simple that I don't think it is necessary to go into details. It can be made in any shop that has a blacksmith's forge.

The crane revolves in a bracket bolted to the bed of



THE CRANE ATTACHED TO LATHE

the lathe, and by adjusting the lever-nut which screws on the hook, the chuck can be raised sufficiently to clear the shears, and lowered so that the threads on the lathe spindle will engage properly with those in the chuck.

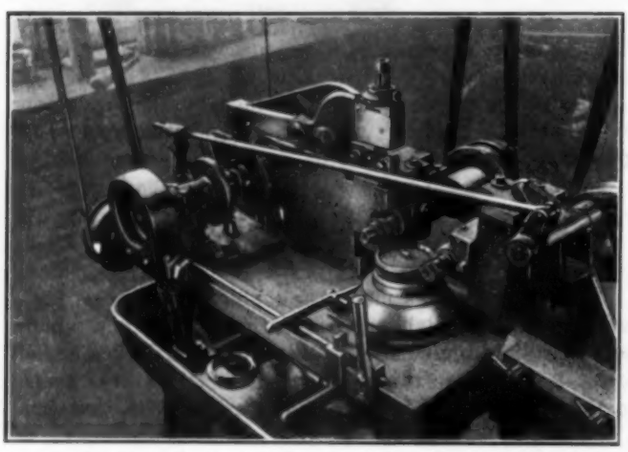
I hope that this device will prove as useful to some of your subscribers as some of those published in your magazine have been to me, even though I have been a subscriber a very short time.

Making a Standard Pinion Cutter Do Double Duty

BY MILTON WRIGHT

The machine shown in the illustration is a standard pinion cutter except for the additional slide at the front, and the cam and connections that actuate it. The work is a bronze ring which forms the top of the needle cylinder of a knitting machine.

The rings are produced in large quantities and in a variety of sizes. Each ring is cut with a series of closely-spaced, rectangular-shaped notches or grooves around its circumference like teeth in a pinion, and with a corresponding number of similarly shaped, radially disposed, notches across its beveled upper surface. The two series of grooves must bear a certain definite relation to each other with respect to position, and within very close limits, but they do not coincide.



STANDARD PINION CUTTER WITH EXTRA HEAD

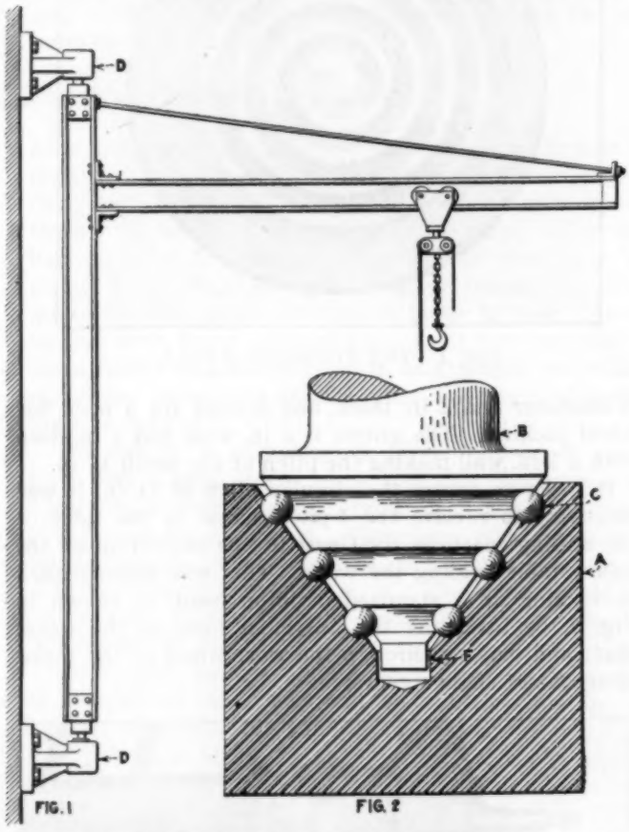
The pinion cutter as originally built would cut either series of grooves separately, or would cut them both at one setting in two revolutions of the indexing mechanism, provided the machine was reset between each turn. But this would require more time than the cutting, so the attachment was devised that enables the machine to complete both operations simultaneously, making a finished ring at each revolution.

The construction of the device is amply evident from the picture and needs no description. The production ranges from eleven to fourteen completed rings per hour, according to diameter. One operator handles six machines.

Step Bearings for a Light Jib Crane

BY W. BURR BENNETT

The accompanying sketches show the bearings designed for a light jib crane to serve lathes, boring mills and similar machines. The thrust and radial features



FIGS. 1 AND 2. CRANE WITH BEARINGS IN POSITION, AND BEARING DETAILS

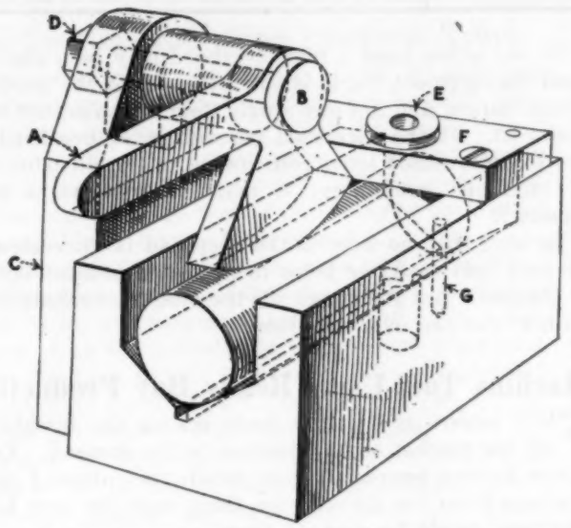
have worked out satisfactorily. Fig. 1 indicates the position of the bearings at the top and bottom of the crane, while Fig. 2 gives a sectional view of the bearing construction. The outer race *A*, detailed in Fig. 2, is supported in the bracket *D*, shown in Fig. 1. Part *A* is made of oil quenching, non-warping tool steel, while the races are polished out after hardening and are not ground. The inner race *B* is of the same material as part A and is finished in the same manner. The balls *C* are hardened and ground steel. Pilot *F* is used merely as an aid in assembling.

Jig for Drilling Pin Holes in Round Work

BY FRANCIS PAQUIN

Herewith is a sketch of a jig for drilling holes in pins from ⅜ to 1 in. diameter.

The jig body consists of a hardened V-block. The



JIG FOR DRILLING PIN HOLES IN ROUND WORK

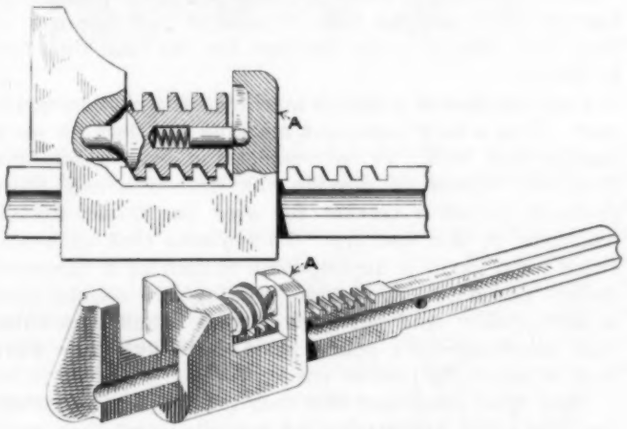
clamp *A* is a slow rise cam pivoted on stud *B* and may be adjusted to take different diameters of work by means of a slot in side piece *C*. After adjusting, nut *D* is tightened. Bushing *E* is held in crosspiece *F*. The work is located horizontally by pin *G*. The form of the cam should be such that on clamping, the work is forced towards the pin.

Quick-Acting Wrench

BY CHAS. H. WILLEY

One of the boys in the shop had an old automobile wrench, and having an inventive mind and some spare time he converted it into a quick-acting wrench as shown in the accompanying sketch.

A hole was drilled in the worm and a pin with a spring was inserted as indicated. The lower lip *A* of the wrench jaw was machined to allow the worm to slide out of engagement with the rack teeth when upward pressure was applied. The sketch tells the story and the inventor passes the idea along to those who may care to use it.



THE ALTERED WRENCH

Attaching a Wire Rope to a Socket —Discussion

We are in receipt of a letter from the National Bureau of Casualty and Surety Underwriters that refers to the article on the subject of attaching a wire rope to a socket, a brief account of which appeared on page 309 in our issue of February twenty-third.

The Bureau states that while it understands that this method of attachment is advocated also by others, it seems that we should point out certain limitations to proper execution that are likely to exist. The limitations are indicated by the following quotations from the letter:

"While this method of attachment when properly done gives good results, so much depends on having the job done under perfect conditions that it should not be attempted by anyone unless he is certain that the materials he uses and the conditions under which he works are perfect.

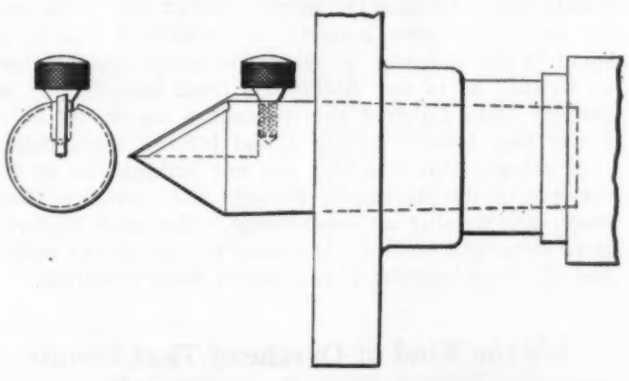
"Frequently an elevator cable will have to be hitched to a socket in a limited period of time. At times the work may be done in some place where the repairman can not have the proper equipment with which to work. As a result and regardless of his skill, the job may be imperfect.

"If you will refer to the 'Safety Code for Elevators,' published by the American Society of Mechanical Engineers, you will find that they advocate the turned-in method of attachment, which position, I believe, was taken largely because of their realization that with that method there is a greater chance of success in a greater number of cases than would be the case if the plan suggested by your writer were followed."

Combined Lathe Center and Center Scraper

BY J. A. RAUGHT

The illustration shows a combined lathe center and scraper for drawing over centers in work that has not been truly centered. The advantage of the contrivance



SCRAPER FOR DRAWING A CENTER

is that the work does not have to be removed from the lathe centers.

In using it, place an indicator against the work, chalk the side to be scraped off and turn down the thumbscrew, to cause the cutter to press against the work. Roll the shaft part way around and back by hand, then relieve the pressure on the cutter by turning back the thumbscrew. Repeat if necessary until the center is drawn over the desired amount. The groove will take care of the chips.

EDITORIALS

An Aid to Foreign Trade

IT MAY surprise some people to learn that there is coming to be an efficient, active and much-consulted governmental aid to foreign commerce in Washington. It is the Bureau of Foreign and Domestic Commerce in the Department of Commerce, and some idea of the esteem in which it is now held may be gained from the fact that it received a larger appropriation from Congress this year than last, a really remarkable tribute in a time of retrenchment like the present.

The director of the bureau, Dr. Julius Klein, whose interesting job it is to make Secretary Hoover's dream of a government department to which business men can look with confidence for aid, come true, attributes the granting of the increased appropriation to the voice of American business which made itself audible to the representatives in Washington at the crucial moment. That American manufacturers and merchants are awakening to the usefulness of this bureau is indicated by the increase in the number of daily inquiries from 750 to over 2,000. The inquiries now coming in are not general ones, but very specific requests for tariff rates, market conditions, shipping instruction, etc.

A significant fact is the way in which several recent foreign loans have been handled. The banks which have been approached for loans have applied to the State Department for advice as to the advisability of granting them. The State Department has given its opinion from the political point of view, but has asked the Department of Commerce for its judgment on the economic side.

In several cases the Department of Commerce has been able to render valuable service by pointing out that no possible return cou'd be expected by American merchants either because the money wanted was to be used for bolstering weak budgets, or because it was to be spent in the purchase of materials under specifications so written as to bar Americans from bidding. If all foreign loans followed this procedure we should be in a fair way toward having a real foreign trade policy.

Machinery concerns that are not making use of the services of the Bureau of Foreign and Domestic Commerce are missing an opportunity. The more inquiries it receives and answers, the more service it can render and the more support it can expect from Congress.

It's the Kind of Overhead That Counts

THERE is much loose talk of "overhead" and perhaps more men deceive themselves regarding it, than about any other item of business. Roughly speaking, the overhead charges of many businesses seem to average about 150 per cent of direct labor. This means very little unless we know all the circumstances. It isn't the percentage of overhead but the *kind* of overhead that really counts.

If the work is such that no machine equipment is required, the overhead should be low for a high overhead would mean too much rent or too high a cost of inspection and supervision, or both.

On the other hand a high overhead may be a sign of good management for it is the total cost of the product which counts, and not any single item which enters into that cost. If the increased percentage of overhead is due to a decreased labor cost, owing to the introduction of improved machinery, it may easily mean a real economy.

Be sure that no item in the overhead is unnecessary. Be sure that each one helps to make the product better or cheaper. But remember it's the *kind* of overhead that counts; not the overhead itself.

Machine Tool Users Really Buy Production

FEW buyers of machine tools realize the instability of the market or how limited is the demand. Even fewer buyers appreciate how much they depend upon machine tools for carrying on their work, or how helpless they would be without them.

Without machine tools there would be no manufacturing—our industrial development would cease. An unhealthy condition among builders of machine tools affects all other industry.

Owing to the high production secured from machine tools and their long life, the demand can be supplied by comparatively few machines. This means that the cost of development of special tools and fixtures must be charged to a small number of machines and shows why machine tools cannot and should not be sold at a price per pound which compares with that asked for other machinery.

As a matter of fact, the purchaser of machine tools really buys productive capacity, rather than so many pounds of iron and steel. He buys the ability to produce machinery of various kinds in tremendous quantities and at a relatively insignificant cost. Whether the machine tool be large or small, light or heavy, is of little importance if the production is satisfactory. The cost can be spread over so many thousands of pieces manufactured as to be almost negligible.

This is one of the things which it is difficult for the manufacturer who uses machine tools to understand. Thanks to efficient machine tools his own product is low in price, and he fails to realize that because of this very efficiency the market for the machine tool is limited.

Take the case of a special machine for a certain motor part. It is a very ingenious machine and does its work rapidly and well. It cost something over a hundred thousand dollars to develop the first one and there probably is not a market for over one hundred such machines in this country. This means that each machine must carry a development burden of a thousand dollars added to the cost of building and selling, plus a fair profit. And yet some buyers attempt to value such machines on a pound basis as though they were just so much pig iron or coal.

They must remember that they are not buying merely machine tools, but productive capacity—and they must be willing to pay accordingly.

Shop Equipment News

Clark Gasoline Elevating Platform Truck

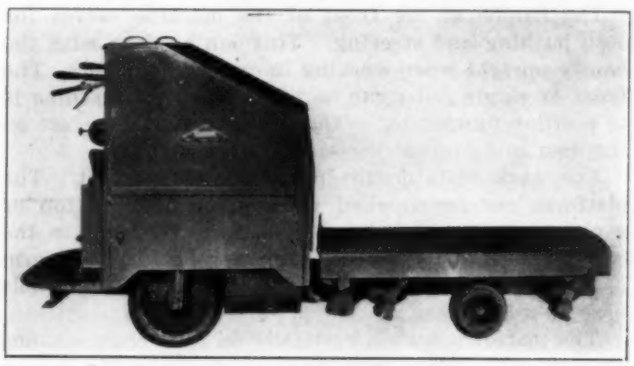
The accompanying illustration shows a gasoline-driven, elevating, platform truck that has recently been placed on the market by the Clark Tructractor Co., Buchanan, Mich. The truck conforms in appearance and uses to the electric lift truck. It is stated to have ease of maintenance and flexibility, and to be capable of continuous 24-hour service if necessary.

The loading platform is 26 in. wide and 54 in. long. It will elevate a load of 4,000 lb. from a minimum height of 11 in. to a maximum height of 16 in. in 8 sec. Automatic stops are provided to control both the upper and lower limits of travel. The elevation can be stopped at any point by means of a control lever. The lifting mechanism is operated by hydraulic pressure.

The power for both the locomotion of the truck and the elevation of the load is derived from a 15-hp., 4-cylinder tractor engine, having 3½-in. bore and 4½-in. stroke. The motor is mounted in the closed compartment at the rear, in which are placed also such parts as the transmission, governor, vacuum tank and radiator.

In order to provide three-point suspension for the entire tractor, the forks carrying the steering wheels are supported on a steel casting pivoted at the center of the frame. The two steering wheels are of cast steel, and have 16 x 3½-in. tires. The two rear wheels under the loading platform serve for driving, and are equipped with 10½ x 5-in. rubber tires.

The drive from the motor is through a bevel geared axle equipped with ball and roller bearings. Two speeds are provided in each direction. The construction resembles very much the standard automotive type, so that the truck can be cared for by an automobile or truck mechanic.

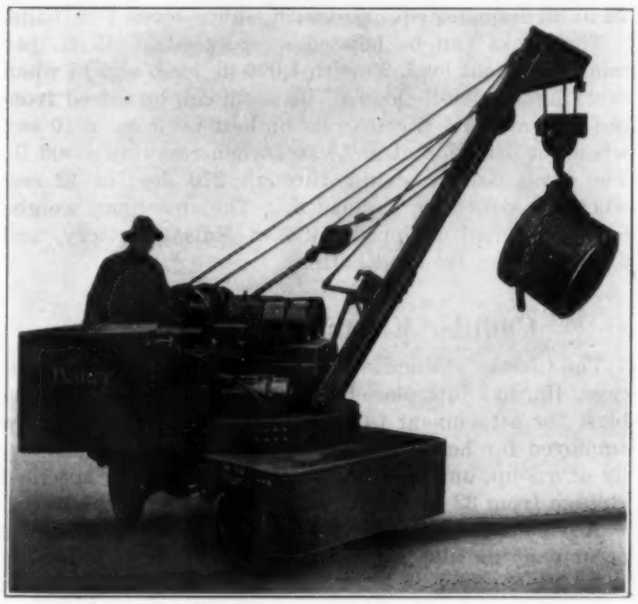


CLARK GASOLINE ELEVATING PLATFORM TRUCK

The driving and elevating controls are mounted on the rear of the engine compartment, where the driver rides in a standing position. The brake lever pedal is under the driver's foot, so that the tractor stops automatically if the operator steps off the machine while it is running. The machine is especially useful for departmental and inter-plant haulage. It will climb a grade of 10 per cent with a 4,000-lb. load. The overall length is 107 in., width 35½ in. and height 51 inches.

Baker Locomotive-Type Industrial Crane

The photograph shows in operation a three-movement, locomotive-type industrial crane recently placed on the market by the Baker R. & L. Co., 2180 West 25th St., Cleveland, Ohio. The crane is intended for lifting and carrying work of all sorts about shops and yards. It has a capacity for lifting 2,000 lb. at a radius of 4 ft. from the pivot of the crane, and 1,600 lb. at a radius of 8 ft. With these loads held on the hook, the cargo can be transported from one place to another. It is easily possible to raise and lower the boom, which is 96 in. long, in order to vary the radius at which the lifting is done. When it is not necessary to transport a load, but merely to lift it, out-riggers can be employed.



BAKER LOCOMOTIVE-TYPE INDUSTRIAL CRANE

The operator stands on a platform at the rear, and has all of the controls on the dash in front of him. The machine is driven by a series-wound, totally inclosed motor running at 1,150 r.p.m. It is capable of a speed of 6 miles per hour in either direction. It drives on all four wheels, and steering is also done on all four wheels. The operator steers the truck by means of the horizontal tiller handle.

The controller is of the drum type and provides three speeds in each direction. A quick make-and-break switch interlocks with the controller, and is operated by the brake pedal, so as to break the circuit when it is desired to stop. Four pairs of helical springs serve to cushion shocks from the road bed. The tires are solid rubber, 20 in. in diameter, and 3½ in. in width in the front and 5 in. in width under the crane end. Worm-type axles having radial and thrust ball-bearings are provided. The wheels are of steel.

A 21-plate Ironclad battery or an Edison battery may be used. The battery is inclosed in a steel compartment, the sides and top of which are removable. The battery

and the crane-operating mechanism are mounted on a base that swings with the load to counterbalance it.

The lifting mechanism is controlled by a push-button located on the dash of the truck. It consists of a Sprague electric 1-ton hoist, having spur and worm gear reduction, and driven by a totally inclosed motor. An electric brake is provided on it. The boom may be hoisted by means of a similar 1-ton hoist operated by a totally inclosed motor, and provided with a brake.

In order to swing the crane, another inclosed motor with an electric brake is provided. The battery and crane swing about a large center stud on a bearing 28 in. in diameter equipped with eighty-seven 1-in. balls.

The hooks can be hoisted at a speed of 45 ft. per minute without load, 20 with 1,000 lb. load, and 15 when carrying a 2,000-lb. load. The boom can be raised from the bottom of its travel to its highest position in 10 sec. when not loaded, and in 15 sec. when carrying 1,000 lb. The crane can be swung through 270 deg. in 12 sec. whether loaded or unloaded. The machine weighs 6,600 lb. when equipped with an Edison battery, and 6,730 with an Ironclad battery.

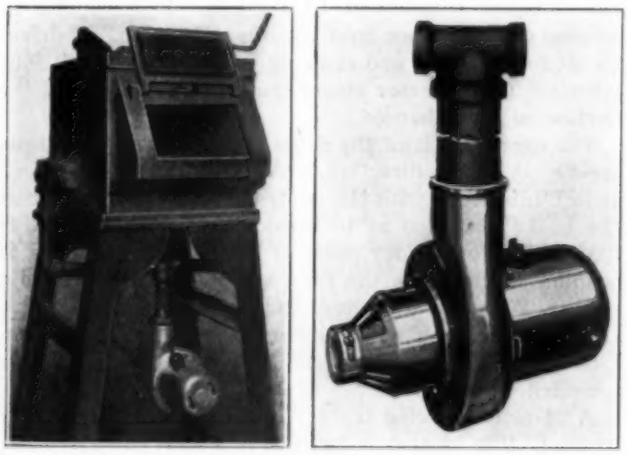
Cadillac Electric Furnace Blast

The Clements Manufacturing Co., 601 Fulton St., Chicago, Ill., has just placed on the market a motor-driven blast for attachment to small gas furnaces such as are employed for heat-treating. The blast consists primarily of a ½-hp. universal motor operating on any specified voltage from 32 to 250, and propelling a small blower.

A view of the blast is shown on the right of the accompanying illustration, and the manner of attaching it to the furnace is shown at the left. The blower is connected to the gas pipe, draws in air from the room, and delivers the mixture directly to the furnace. A damper is provided for regulating the mixture.

The motor can be driven from the lighting circuit merely by attaching a plug to a convenient socket. It can thus be operated without the necessity of having the line shaft turning, as is often necessary with the ordinary style of blower equipment. Due to the speed of the motor, the furnace can be brought to the working temperature very quickly.

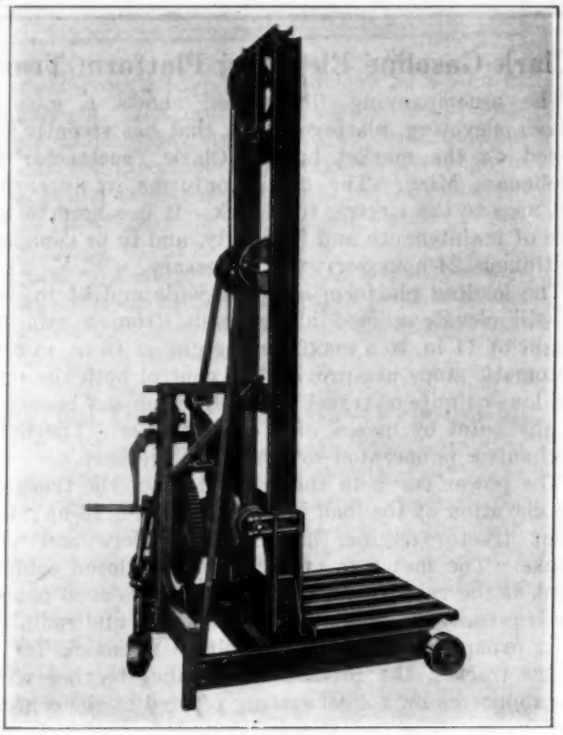
Fluctuations in the gas pressure do not affect the operation of the blower or of the furnace, so that constant conditions can be maintained in the furnace. The blast delivers 210 cu.ft. of air per minute when running at 10,000 r.p.m. It weighs 9 lb., and 13 lb. when packed.



CADILLAC ELECTRIC FURNACE BLAST

Lewis-Shepard Stacker

The accompanying illustration shows a machine intended for lifting, transporting and tiering materials in a shop or warehouse. The device, designated as a



LEWIS-SHEPARD STACKER

stacker, has recently been placed on the market by the Lewis-Shepard Co., 560 East First St., Boston, Mass. It is made of structural steel and is mounted on three roller-bearing wheels 7 in. in diameter, so that it can be conveyed about the shop either loaded or unloaded.

The handle at the front of the machine serves for both pushing and steering. This can be done with the handle upright when working in cramped quarters. The front or single roller can be lifted when the machine is in position to operate, so that the two steel legs rest on the floor and prevent the stacker from moving.

The work rests on the platform at the right. The platform can be supplied with either a roller top or a plain top, its minimum height from the floor in the two cases being 10 and 8 in. respectively. The platform is 36 in. wide and 24 in. long, and the size of the whole base 39 x 50 inches.

The platform travels vertically on 5-in. channels, one at each side. Easy movement is given by the rollers running on the edges of the channels. It should be noted that these vertical channels are hinged, so that the top portions may be lowered. It is thus possible to move the stacker through doorways. The height at which this hinge is placed, as well as the length of the channels, can be furnished to suit the work at hand. The standard machines are supplied in heights up to 14 ft. The joint can be locked when the stacker is in use.

The machine may be operated either by hand or by electric power. As shown, the hand crank is connected through gearing to the drum on which the cable connected to the table is wound. The 500-lb. capacity stacker has a lifting speed of 13 ft. per minute when the crank is turned at 60 turns per minute. With the

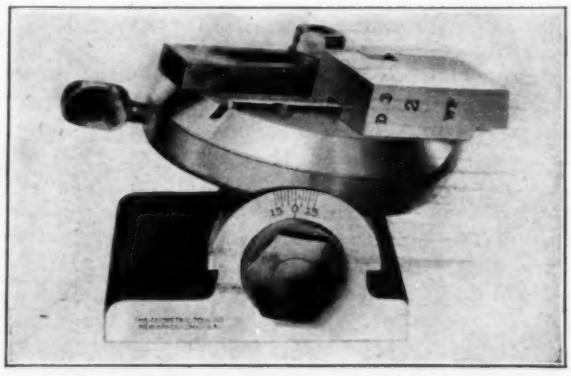
same speed of the crank, the lifts are 11, 8, 5 and 4 ft per minute, respectively, for the machines of 750, 1,000, 1,500 and 2,000 lb. capacity. On all except the smallest size, an additional speed is provided that doubles the speeds just mentioned. In this way the platform may be lifted rapidly when lightly loaded.

When lowering the platform it is not necessary to turn the crank. By pulling on the lever above the gearing, the brake is released, so that the weight of the load causes the platform to descend. As soon as the operator ceases to pull on the lever, it returns to its original position and the clutch engages, so that the platform is held stationary. The speed of lowering depends upon the force with which the lever is pulled. The combined clutch and brake is of the automobile type, and has a single dry plate. It is completely enclosed and is self-adjusting.

Geometric Chamfer Grinding Fixture

The illustration shows a grinding fixture recently placed on the market by the Geometric Tool Co., New Haven, Conn., for grinding chamfers on the milled chasers made by the concern. The fixture may also be used for grinding tapped chasers, although in the latter case the grinding is straight and does not conform exactly to the contour of the threads. The use of the fixture permits of grinding equally all chasers of a set. When the chamfers are ground unevenly most of the cutting is done by one or two chasers, which is apt to result in threads having incorrect lead or taper.

Either left-hand or right-hand chasers may be ground on the fixture. The table of the fixture is graduated and can be set for grinding either long or short chamfers. The narrow key on the top engages the keyway in the chaser and acts as a guide while grinding. An adjustable stop governs the position of the chaser with respect to the grinding wheel. The side of the fixture is graduated to permit of tilting the table to the desired angle of chamfer clearance. One grinding fixture accommodates all sizes of chasers. When used for ⅛-in.



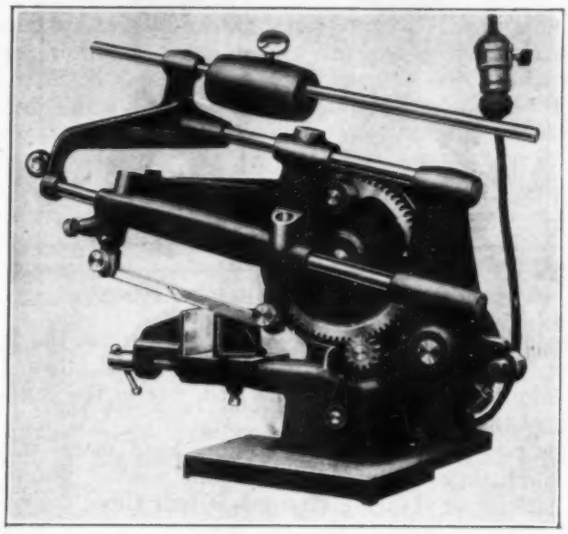
GEOMETRIC CHAMFER GRINDING FIXTURE

chasers, it is necessary to remove the key at the top of the table and guide the chaser in the keyway.

The fixture may be bolted to the table of the grinding machine, and the chaser slid forward by hand to the wheel and against the stop provided. It may be set forward by means of the machine handwheel or lever. The fixture can also be mounted on the machine slide, and the chasers ground by passing them across the edge of the grinding wheel. For this purpose, a wheel of sufficient size must be available.

Edlund Bench Hack Sawing Machine

The machine shown in the accompanying illustration is a power-driven portable hack sawing machine for mounting on a bench. It has recently been placed on the market by the Edlund Machinery Co., Inc., Cortland, N. Y. It is intended for fast cutting on small jobs ordinarily performed by hand, or on work regularly



EDLUND BENCH HACK SAWING MACHINE

performed by larger machines. It can be used on tool steel as well as softer metals.

The power is supplied by a small electric motor, connected to the machine through gearing. Current for the motor can be taken from any convenient lighting socket. The saw arm has two rods on which the saw frame slides. The arm stays in position when raised by the operator for placing work in the machine. Cutting is performed on the backward stroke, and the arm raises on the forward stroke, so that the saw blade is relieved from the work.

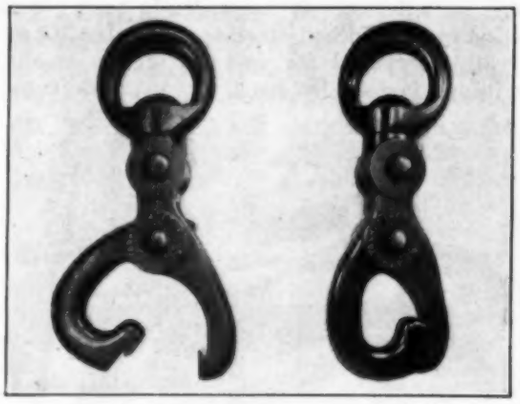
The position of the weight on the top of the arm is adjustable, so that the pressure of the feed can be varied to suit the type of work being cut. An 8-in. blade is used, and it may be changed without the use of any tool. The machine stops automatically when the cut is finished, although it can also be stopped and started at any time during a cut. A screw-operated vise is provided for holding the work. The wearing parts can be easily replaced when they have become worn.

Yankee Safety Hook

Frank W. Trabold, 30 Church St., New York, N. Y., has recently placed on the market the "Yankee" safety hook for use on hoists and cranes when lifting loads. The accompanying illustration shows the hook in both the open and closed positions. It will be noted that the load hangs directly on a curved member pivoted on the other longer member shown at the left side.

It will be noted that in the closed position, the hook engages with a dovetail on the straight member. Engagement is made possible by an elongated hole in the top of the hook, so that it can be raised slightly. At the top of the longer straight member is pivoted a member to which is ordinarily attached a swiveling ring. The lower portion of the top member rests against the top

of the hook, so that the hook cannot be swung out of position unless the top member is also swung to the side. Thus all load must be off the hook in order to



TRABOLD "YANKEE" SAFETY HOOK

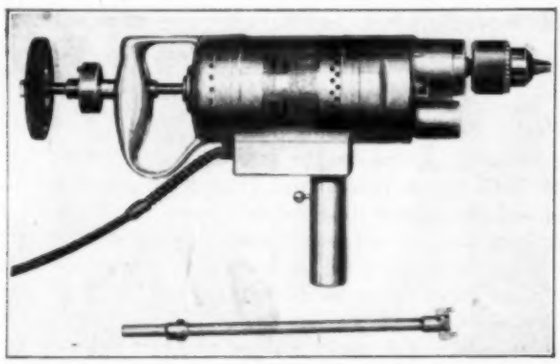
open it. The hook member ordinarily carries the load alone. When the load becomes excessive, then the straight member shares in the load, due to the engagement of the dovetail.

The two pins in the hook are made of monel metal. Although they are intended to be the weakest points of the hook, their shearing strength is four times the rated load. Due to the fact that the outer end of the hook is supported, the hook does not straighten out when the load exceeds the elastic limit of the metal in it. Thus, failure of the hook can occur only when the load exceeds the ultimate strength, and not when it exceeds the elastic limit. Due to the fact that the point of the hook is covered, it cannot catch on parts which it strikes while the load is being lifted.

For attachment directly to a cable, the third or swiveling member may be omitted. When the hook is attached to a block for either a pulley or a chain, the top member ordinarily swivels directly in the lower part of the block. The hoist is ordinarily made in sizes having capacities of 1, 3, 5, 15 and 25 tons.

Louisville Electric Drill Grinding Attachment

The accompanying illustration shows a grinding attachment in place on a ¾-in. portable electric drill, so as to adapt the tool to such work as sharpening toolbits



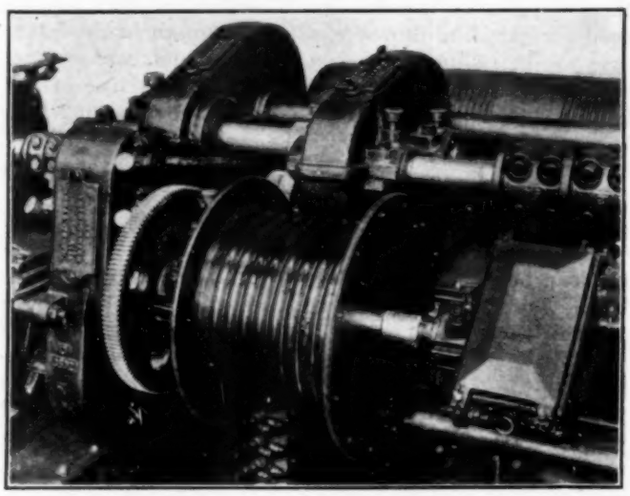
GRINDING ATTACHMENT ON LOUISVILLE DRILL

This attachment has recently been applied by the Louisville Electric Manufacturing Co., Thirty-first and Magazine Sts., Louisville, Ky., to its Pioneer "garage special" drill. The drill has the usual drilling spindle as well as a device for oscillating the valve grinding tool. The tool for driving the valve while grinding is shown below the drill in the accompanying illustration.

The grinding attachment fits in the rear of the armature shaft and passes through the handle. It may be put in place and removed quickly. The bearing that fits in the handle is equipped with ball bearings for the spindle, the speed of which is normally 9,000 r.p.m. The tool can be furnished to operate on either alternating or direct current of either 110 or 220 volts. The abrasive wheel usually carried is 2 or 3 in. in diameter.

Pawling & Harnischfeger Feeder-Cable Retriever

The Pawling & Harnischfeger Co., Milwaukee, Wis., has recently placed on the market a winding device or retriever for the cable supplying current to a lifting magnet carried by a crane. The accompanying illustration shows the device applied to the carriage of a



PAWLING & HARNISCHFEGER CABLE RETRIEVER

5-ton crane having a 70-ft. span. The large, flanged drum is driven by the motor that hoists the magnet.

The retriever keeps the cable taut at all times, so that no slack is allowed. The cable thus winds evenly on the drum, and cannot work over the flange. The drum is driven only while the magnet is being hoisted. Although the drive is through gears, the final drive is through friction members. The gearing is so proportioned that it tends to drive the drum at a peripheral speed 20 to 50 per cent in excess of the speed at which the magnet is being hoisted. If there should be any slack in the feeder cable when the hoisting starts, it is immediately taken out. After that, the friction members slip and keep a constant tension in the cable of about 40 lb. This tension is adjustable.

When the magnet is being lowered, the cable drum is not driven. A pawl engages in a ratchet wheel to prevent revolution. The pull of the magnet thus unwinds the cable from the drum against the retarding force of the friction mechanism, so that a uniform tension is always maintained.

All the bearings are bronze bushed. The current is brought to the drum through collector rings and carbon brushes that operate in the same manner as the

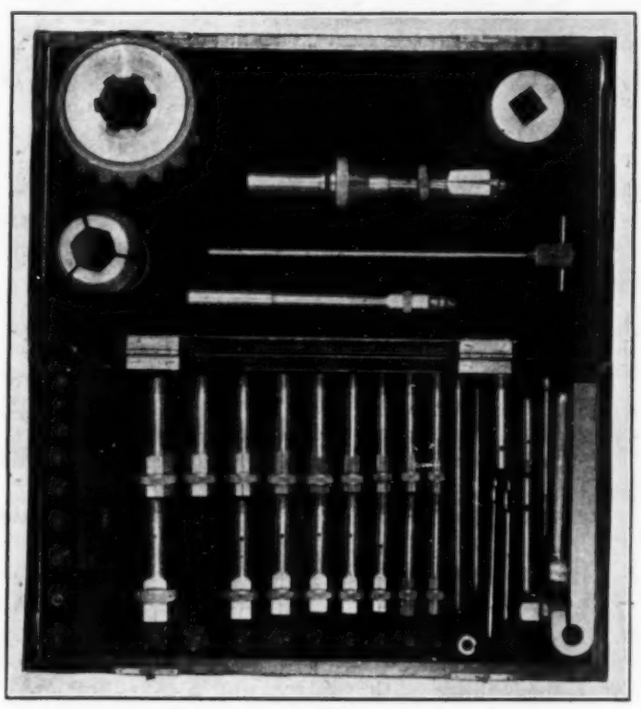
slip rings of alternating-current motors. The collector is mounted at the end of the shaft and inclosed in a metal housing, so as to be completely protected, although available for inspection. The cable is attached to the collector rings, passes through a hole in the center of the shaft, then along the drum arm, and through a hole in the rim. It is then wound on the drum itself. There are no exposed electrical contacts.

Hollander Adjustable Broaches

The Edward Hollander Tool Co., 142 Miller St., Newark, N. J., has recently placed on the market a line of adjustable broaches, a set of which is shown in the accompanying illustration. The tool is intended for use primarily in a shaper, although it can be used in a drilling machine, lathe or screw machine. Its chief application is in shops where a broaching machine is not available. Although adapted chiefly to tool room use, it is applicable to regular production.

With the tool it is possible to broach holes that do not go entirely through a part, so as to enable an ordinary broach to be employed. It is necessary, however, that there be some recess at the bottom of the hole. An example of this sort of work is the broaching of a hole through one side of a hollow cylinder. A number of strokes are necessary in order to bring the hole up to size. The tool is started at its smallest size in a drilled hole, and its size increased with each stroke. It is stated that it leaves a very fine finish on the work and that it is very accurate. Samples of work are shown on the cover of the box. Splines can be cut in holes, as well as the squares and hexagons for which this set is intended.

The tool is made in two styles. The simplest form, type B, is shown lying on the cover of the box near the hinges. It consists of a shank, on one end of which are the cutting edges. This end is slit in the center of each flat face, so that it can be expanded when a conical member is screwed into it. The screw is on the front end of the tool, and is turned by means of the slender rod shown that can be passed entirely through the hole while the shaper is running.



HOLLANDER ADJUSTABLE BROACHES

The type A broach is shown lying on the center of the cover. It consists of a holder that can be held in any suitable shank, and that has a mechanism for expanding the cutter. By means of graduations on the collar, the expansion of the tool can be read directly in thousandths of an inch. Any size of cutter can be secured to the front end of the holder. In the set shown cutters for holes from $\frac{1}{4}$ to $\frac{3}{4}$ in. across the flats are furnished in $\frac{1}{16}$-in. steps. The smaller sizes are held by means of a reducing coupling. It will be noted that cutters for both square and hexagon holes are furnished.

The small parts shown along the edges of the box are the conical expanding members. These members serve as guides for the cutters and bear against the sides of the cylindrical hole. The tools ordinarily cut to a depth of $2\frac{1}{2}$ in., although an extension attachment is provided that enables cutting to 5-in. depth. Cutters either smaller or larger than those in the set can be furnished for use with the same holder.

The rings shown around the cutters in the box hold the cutting edges together, so that they do not spread outward on the first cut. The cutting edges are spread for each succeeding stroke, as shown by the tool lying on the cover of the box. The micrometer adjustment on the type A holder enables bringing the holes to exact size. The expanding mechanism enables the putting of relief on holes that are broached through die plates.

Sharpening of the cutters is done by merely grinding the front face. It is stated that fifty holes can usually be cut without grinding. The cutters can be furnished either individually or in sets to suit any requirements. At the right side of the box can be seen a shank for holding the broaches, and wrenches for use in changing the cutters in the holder.

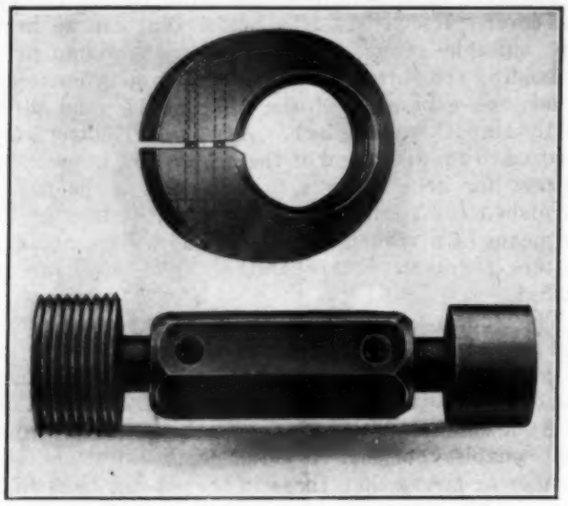
"Superior" Thread Gages

The Superior Thread Gauge Manufacturing Co., 1985 Troy Ave., Brooklyn, N. Y., has recently placed on the market the ring thread gage shown at the top of the accompanying illustration. The principal feature of the gage is that the hole is eccentric to the outside diameter. In this way, sufficient spring is obtained at the small section of the gage to enable adjustment of size.

It is not necessary to put one or more saw cuts partially through the ring, as is ordinarily done when the hole is concentric with the outside of the gage. Thus the continuity of the thread is not broken, except at the one cut which is necessary to provide adjustment of size. The threads are more apt to retain their correct form during the hardening process than if they are cut into several sections. By placing the hole eccentrically, a smaller outside diameter is possible than with the concentric style.

The size is adjusted by means of the screws that are shown dotted on the top of the gage. A hole near the threads contains a small rod, against which at each end a setscrew bears. By tightening the screws, the gage is expanded. The other screw is used for drawing the ring together, so that the gage may be held rigidly at any size in its range. The gage is intended especially for work on production where an adjustment of size is necessary.

At the bottom of the illustration is shown a plug gage, the ends of which are removable. At one end, a plug thread gage of the size desired is fitted, while



"SUPERIOR" THREAD GAGES

a plain cylindrical plug equal to the root diameter of thread is held at the other. Setscrews bearing on milled recesses in the shanks of the ends hold the gages securely in the handle. Both the ring and the plug gages are made in sizes for U. S. S. and S. A. E. threads from ¼ to 2 in. in size. They can be furnished larger to suit special work.

American Amplifying Gage

In the accompanying illustration is shown an amplifying gage that has recently been placed on the market by the American Gauge Co., Dayton, Ohio. The tool is similar to the larger gage made by the concern, although it is more limited in its range and does not have all of the attachments that are furnished on the large gage. The gage is intended for use in grinding and inspection departments, but it is particularly well adapted to grinding departments, where a number of gages are required and the flexibility of the equipment is not so important.

AMERICAN AMPLIFYING GAGE

The tool can be furnished in two sizes, one for measuring round work from ¼ to 2 in. in diameter and the other for work from 2 to 4 in. in diameter. The adjustments and the movements provided can be seen in the illustration. The anvil block can be removed and its position adjusted, as can also the stop for the work. The height and position of the measuring point are controlled by moving the entire arm of the machine. Clamping levers serve to lock the adjustments in place.

The gage stands on a bench, and can be easily moved to the place required.

Fundamentals of Budget Control

In an address before the Taylor Society in Philadelphia, on March 7, George E. Frazer of Chicago outlined the fundamentals of budget control as follows:

I. ELEMENTS IN CONTROL.
- (1) A responsible organization.
- (2) Accounts that lead to accountability.
- (3) The business budget, i.e., estimates of future accounts as basis for future accountability of responsible organization.

II. RESPONSIBLE ORGANIZATION.
- (1) Separation of policy making from executive powers.
- (2) Executive clothed with complete executive authority.
- (3) The line of authority.
- (4) Staff assistants to the president.

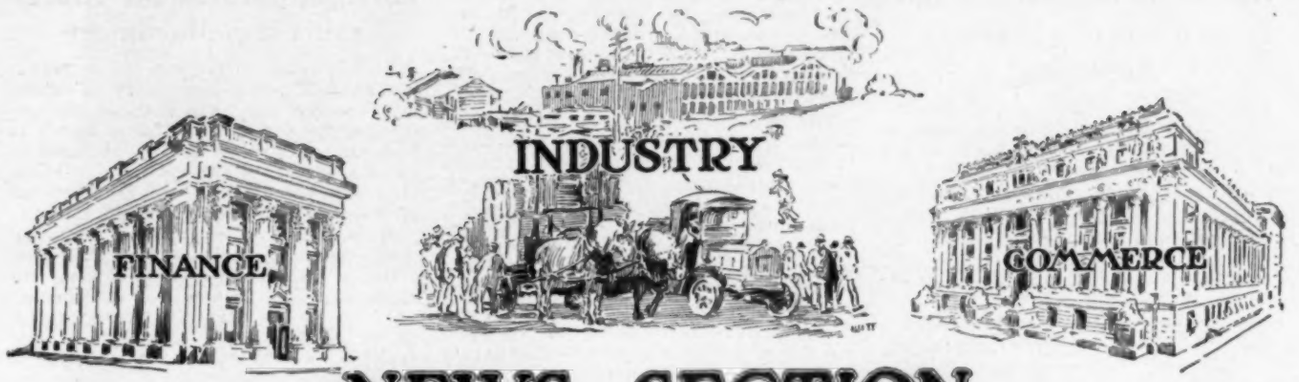
III. TYPES OF ORGANIZATION IN THEIR RELATION TO ACCOUNTABILITY
- (1) Functional.
- (2) Territorial.
- (3) Commodity.
- (4) Combinations of three basic types.

IV ACCOUNTS REFLECTING ACCOUNTABILITY.
- (1) Functional accounting.
- (2) Territorial accounting.
- (3) Commodity accounting.
- (4) Classification of accounts must reflect the accountability actually existing, not the theoretical accountability.

V. BUSINESS BUDGETS.
- (1) Estimates of future accounts in terms of future accountability.
- (2) Functional estimates.
- (3) Territorial estimates.
- (4) Commodity estimates.
- (5) Future budgets in terms of present personalities.

VI. BUDGET ADMINISTRATION.
- (1) Must be in terms of organization.
- (2) To be practicable must be reduced to ratios, i.e., standard percentages or variable percentages.
- (3) Illustrations as to sales quotas.
- (4) Illustrations as to production standards, e.g., machine rates.
- (5) Illustrations as to credit standings, e.g., the conventional ratio of quick assets to current liabilities as used by commercial bankers.

He emphasized the necessity for a separation of the policy making and the executive functions, the necessity of responsibility with control, and a classification of expense to show accountability.



NEWS SECTION

German Machine Tool Exports Decrease

The following analysis by the industrial machinery division of the Department of Commerce, based on the latest figures received from Germany, indicates that there has been a considerable decrease in the volume of Germany's machine tool exports during 1921, as compared with 1920 and the pre-war year 1913:

	7 Months May-Nov. 1921 Metric Tons.	12 Months 1920 Metric Tons.
Belgium	7,547.7	7,452.7
Denmark	780.8	2,806.6
Alsace-Lorraine	468.4	1,827.0
France	5,087.9	13,668.3
Great Britain	1,057.7	1,619.7
Italy	3,466.7	7,546.3
Netherlands	4,559.3	19,054.1
Norway	360.6	1,535.1
Austria	2,823.7	4,978.7
Czecho-Slovakia	1,796.6	3,360.4
Sweden	533.3	5,433.5
Switzerland	1,738.5	11,760.7
Spain	1,238.4	3,268.9
South America	1,582.8	2,949.4
Other countries	6,003.7	7,659.8
Total	39,046.1	94,921.2

Taking the total of 39,046 metric tons for the seven months of 1921 and employing the same ratio for the missing months, 1921 would give a total of approximately 67,000 metric tons, a falling off in volume of 27,921 tons from 1920 and of 23,279 as compared with 1913.

Safety Engineers Affiliate with A. S. M. E.

The council of the American Society of Mechanical Engineers, at a meeting held March 6 in Kansas City, accepted the petition of the American Society of Safety Engineers for affiliation with the A. S. M. E. By this action 600 new affiliate members are added to the A. S. M. E. membership role, which is rapidly reaching 20,000.

The affiliation was effected under the provisions of the A. S. M. E. by-laws, according to which the privilege of affiliation with the A. S. M. E. may be obtained by any regularly organized engineering society which by constitution, by-laws and practice is in accord with the A. S. M. E., on the approval of the governing boards of each. The society so affiliated has independence, autonomy and self-control under its own constitution and by-laws, and the A. S. M. E. is not responsible for its acts.

Mexican Chamber Organized in New York

Sponsored by several prominent New York business men, the Mexican Chamber of Commerce of the United States, has been organized and has established itself in offices in the Woolworth Bldg. in that city. The chamber has been incorporated under the laws of New York.

The directorate is composed of citizens of both countries who are actively engaged in important industries. Among the directors are: Gumaro Villalobos, Elbert Gary, Carlos B. Zetina, James W. Gerard, S. L. Alatriste, Grafton Greenough, Francisco P. De Hoyos, Russell R. Whitmann, George L. Le Blanc, Carlos R. Felix, Jose Miguel Bejarano, Joseph Hodgson, G. G. Cano, Jerome S. Hess, L. J. Roel, M. L. Gallagher. Officers are: President, S. L. Alatriste; vice-presidents, James W. Gerard, Jerome S. Hess and Russell R. Whitmann; treasurer, Jose Miguel Bejarano.

Hendey Machine Co. Publishes Anniversary Book

In celebration of the completion of fifty years in the machine tool business, the Hendey Machine Co. has published a limited edition of a 112-page book dedicated "To the men who build our machines and in the building strive for perfection; to the friends who use our machines and in the using realize our aims." The book is beautifully printed on heavy paper and illustrated by photogravure portraits of the presidents of the company and by halftones of the different shops occupied and the product produced in them.

The story opens with a tribute to the founder, Henry J. Hendey, and his ideals, and tells of the early struggles of Mr. Hendey and his brother Arthur to establish a business in the years 1870-73. The foundation of the joint stock company followed in 1874. Then follow descriptions of the various buildings and the different machines built by the company.

A brief account is given of the war activities of the Hendey Machine Co. and its adherence to the high standards of its founder. Then comes a word on the work of the company since the armistice and a conclusion telling of the fulfillment of Mr. Hendey's vision of a successful combination of the ideal with the practical.

Gear Manufacturers at Buffalo This Month

Plans are rapidly being completed for the annual convention of the American Gear Manufacturers' Association, which will be held in Buffalo, N. Y., on April 20 to 22, with headquarters in the Hotel Lafayette.

The papers to be presented at the technical sessions cover a wide variety of subjects pertinent to the gear manufacturing field. Among those already scheduled are: "The Use of the Projection Comparator in Testing Gear Teeth," by Ralph E. Flanders of the Jones & Lamson Machine Co.; "Good Practice for the Cutting Faces in Clearance of Hob, Gear and Form Cutter Teeth," by H. E. Harris of the Harris Engineering Co.; "Proportions of Industrial Gears," by G. E. Katzenmeyer of the R. D. Nuttall Co.; "The Grinding of Gear Teeth and Its Future in Industry," by R. S. Drummond.

Besides the committee reports and the various entertainment features, there will be presented an explanation of the Gleason Works system of bevel gears by F. E. McMullen of that company.

The secretary of the association is F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Government Bureaus to Study Drill Steels

A mining engineer and a metallurgist are to be selected by the Bureau of Mines and by the Bureau of Standards in the near future to make an intensive study as to present practice in the heat-treatment of drill steels and the extent to which breakage occurs. These engineers are to make a much more exhaustive survey than ever has been attempted before. They will submit a report to the advisory board which is co-operating with the bureaus in the study of rock drill steels and other steels which must withstand impact stresses. The advisory committee is composed of B. F. Tillson, T. R. Lawson, George T. Cousins, H. S. Brainard, J. A. Mathews, George H. Clark, H. M. Boylston, Van H. Manning, F. W. Deonton, Walcott Remington and Bradley Soughton.

The survey about to be undertaken is under the immediate supervision of D. A. Lyon, chief metallurgist of the Bureau of Mines, and G. K. Burgess, of the Bureau of Standards.

The Trend of Business Improvement—Plants Resuming

The Bridgeport Casting Co., Bridgeport, Conn., has increased operations at its plant from a four-day week to a full six-day week basis.

C. H. Wills & Co., Marysville, Mich., manufacturers of the Wills-Sainte Claire automobile, have advanced production from 15 to 20 cars a day, giving employment to about 600 operatives at the plant.

The Ames Shovel and Tool Works, Elwood, Ind., have resumed operations on a full time, full week basis.

The Harrisburg Pipe and Pipe Bending Works, Harrisburg, Pa., have adopted a double-shift operating schedule in a number of departments at the plant, including steel works, coupling shop and coil shop.

The Cyclone Motors Co., Benton Harbor, Mich., will commence operations at its new local plant this month, with a production schedule of 50 motorcycles per day.

The Osgood Bradley Car Co., Worcester, Mass., has received a contract from the Connecticut Co., for twenty-five one-man cars for its traction lines, totaling $150,000. The company has orders on hand to insure full operations for some time to come.

The Autocar Co., Ardmore, Pa., manufacturer of motor trucks, has increased the working schedule three hours a week at its plant. Orders received for the first quarter of the year are 25 per cent in excess of those for the corresponding period in 1921. The plant is giving employment to about 2,000 men.

The Singer Manufacturing Co., Bridgeport, Conn., manufacturer of sewing machines and parts, has advanced operations from 3 to 5 days a week at the local plant.

The Haynes Automobile Co., Kokomo, Ind., is doubling its output, as compared with the basis of production for a number of months past.

The Stover Manufacturing and Engine Co., Freeport, Ill., is increasing production at its plant and is now operating at close to normal.

The Burden Iron Co., South Troy, N. Y., manufacturer of horse shoes, bar iron, etc., has resumed production at its plant after a shut down of about a month. About 1,000 men will be employed.

The Reo Motor Co., Lansing, Mich., is giving employment to a full working force, with entire plant operating on close to full time. The working hours in a number of departments will be increased at an early date.

The Frick Co., Waynesboro, Pa., manufacturer of agricultural implements, is increasing operations at its plant, with incoming orders about 50 per cent in excess of those received at this time a year ago. A complete new foundry will be erected, with daily capacity of about 60 tons of iron castings, designed to give employment to over 500 molders. The present foundry will be demolished upon the completion of the new structure, and the site used for the construction of additions to the machine shops.

The Moon Motor Car Co., St. Louis, Mo., has adopted a 25 per cent increase in production schedule for April and May, as compared with the same months of last year. The company has sufficient orders on hand to insure capacity operations until well into July.

The Remington Arms Co., Bridgeport, Conn., has advanced production to a 48-hour week basis at its local firearms plant, replacing a three-day week schedule, operative for some time past. The works will give employment to 3,000 persons. The cutlery division is employing approximately 800 workers under an increased production basis.

The Motor Axle Co., Flint, Mich., has adopted a full time operating schedule in all important departments at its plant, replacing a short-time working basis, prevailing for a number of months past.

The Peerless Motor Car Co., Cleveland, Ohio, is operating on the highest production schedule that has been attained since May, 1920. Record shipments of complete cars are being made.

The Mullins Body Corporation, Salem, Ohio, manufacturer of automobile bodies, has increased its working force by about 500 men.

The John A. Roebling's Sons Co., Trenton, N. J., manufacturer of wire, wire rope, etc., is operating on a 60 per cent capacity, as compared with a 35 and 40 per cent basis a few months ago.

The General Motors Corporation, Detroit, Mich., is operating its different plants on a production basis of 60,000 passenger cars, motor trucks and tractors during the current quarter of the year, as compared with an output of 24,600 cars of all kinds in the corresponding period of a year ago. The Buick division is leading all others in output. The total production in February was 21,000 cars as against a total manufacture of 8,900 cars in the same month of 1921.

The Foote-Burt Co., St. Clair Ave., Cleveland, Ohio, manufacturer of machine tools, etc., is increasing production to handle incoming orders.

The Chicago, Milwaukee & St. Paul Railroad Co., Chicago, Ill., has arranged an appropriation of $10,000,000 for new equipment, to include cars and other rolling stock, rails, repair shop equipment, etc. An order has been given to the Pullman Co., Chicago, for 1,000 box cars, and to the Western Steel Car and Foundry Co., Chicago, Bettendorf Axle Co., Bettendorf, Ia., and the General American Tank Car Co., New York, for similar cars, totaling 1,000, 1,500 and 500 cars, in the order noted.

The Ruggles Motor Truck Co., Saginaw, Mich., is increasing operations at its plant, with the adoption of a production schedule calling for 2,000 motor trucks during the present year. A branch plant has been established at London, Ont., and is now in operation to handle Canadian business.

The Pressed Steel Car Co., Pittsburgh, Pa., has secured an order for 2,000 seventy-ton coal cars from the Norfolk & Western Railway Co.

The Hendee Manufacturing Co., Springfield, Mass., manufacturer of motorcycles, has arranged a production schedule of 1,400 complete machines for April and the suceeding months of the year. Up to the present time the monthly output has been on a basis of 600 motorcycles.

Foreign Markets for American Farm Machinery

An opportunity for American manufacturers of potato machinery to extend their markets is presented in the increased development of that industry in Ireland. A list of dealers in agricultural implements and machinery in Ireland can be secured from the Bureau of Foreign and Domestic Commerce.

Horse-drawn wheel plows, duck-foot chain harrows, cultivators, and seed-drills are in demand in Sardinia, the Department of Commerce is informed. This market is attracting the attention of British exporters and should also prove to be well worth the attention of American manufacturers of such implements.

Tooth harrows are used more than any other in South Africa, but there is a constantly increasing demand for the disk type. In the Northern Transvaal there is considerable increased farming activity, and the demand for implements and machinery in this section merits consideration.

In East Africa, agricultural development is making rapid progress and the demand for machinery and implements is now greater than it has ever been in this region. The tractor market in South Africa is largely in the hands of American exporters, and according to our British competitors, this is largely due to American enterprise and superior selling methods.

Windmills and well-drilling machinery offer a good market in South Africa. Both the government and private firms and individuals are excellent prospects. The year 1921 showed an increase in buying of these articles as compared with 1920 and the demand for them continues unabated with excellent prospects for a further increase in 1922. The trade in windmills is largely in the hands of American manufacturers and, although British manufacturers are showing an increased interest in this market, there is no reason why the American product can not hold its leading position.

Census Shows Distribution of Machinists in 1920

Additional figures from the Bureau of Census show the re-distribution of machinists and toolmakers during the ten years between 1910 and 1920. A few comparisons are given herewith:

St. Paul, Minn., had 2,251 machinists and toolmakers when the 1920 census was taken. There were 1,760 in 1910.

Camden, N. J., had 2,042 machinists and toolmakers when the 1920 census was taken. This compares with 1,391 in 1910.

Vermont had 3,135 machinists and toolmakers when the 1920 census was taken. This compares with 2,321 in 1910. New Mexico had 1,137 machinists and toolmakers in 1920 and 518 when the 1910 census was taken.

Reading, Pa., had 1,980 machinists and toolmakers in 1920. This compares with 1,534 in 1910. Salt Lake City, Utah, had 838 machinists and toolmakers in 1920, and 516 when the 1910 census was taken.

Nashville, Tenn., had 988 machinists and toolmakers when the 1920 census was taken. This compares with 711 machinist and toolmakers in 1910.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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At a private dinner given in New York last week sixteen important and well informed men of large affairs were present. They were all bitterly opposed to the passage of the bonus bill but they were nevertheless unanimous in saying that they believed that the Senate would attach to it a rider providing for the necessary revenue by a sales tax, and that in this shape the bill would be returned to the House of Representatives and passed by a large majority. They all agreed that if this happened a period of wild inflation and speculation was likely to follow because the money distributed would be rapidly spent and because a sales tax would provide a comparatively painless method of raising a revenue so large that it would incite further extravagance on the part of Congress.

While I am not entirely in sympathy with this view and still hope that the Senate will have the good sense to quietly inter the bonus bill, I feel that it is my duty to present both sides of the picture, and if the bonus bill is passed and the sales tax produces the revenue that many people expect it will yield, I must admit that the result will be an era of political extravagance during which prices will at first advance sensationally and afterward decline disastrously, because the purchasing power of the nation will be dissipated by the drafts made upon it to support a program of unbridled extravagance. We now face an estimated Treasury deficit of about $300,000,000 for the next fiscal year, and the prospect of increased taxes to meet this deficit and to pay the interest on the sums which states and municipalities are borrowing with apparently so little thought of the day of reckoning is not alluring, although the prosperity resulting from the expenditure of these sums, by inducing what I once termed the "anasthesia of inflation," may render us temporarily insensible to its possible after effects.

Markets Still Strong

The resumption of the upward movement in the speculative markets last week, after a reaction to allow trade and industrial improvement to catch up, is due, I think, to a renewed appreciation of these conditions. The forces which have been making for recovery, particularly of the easing money markets, are as strong as ever. There is no decrease in the avidity of the demand for good investment securities. Last week Liberty third 4¼s, which sold at 83 in 1919, crossed par for the first time since their issue, and the continued strength of the market would seem to foreshadow further cuts in rediscount rates in addition to the reductions announced by the Atlanta and Chicago Federal Reserve Banks last week.

Stocks are strong. They have recovered most of their recent decline and in some instances have advanced to new high levels for the year, a gain which clearly could not have been supported had not a sufficient number of people believed that industrial recovery is destined to go further or that we are on the eve of an orgy of expenditure. What they call it depends entirely on how far ahead they are looking and is immaterial as long as their belief in higher prices and better business in the near future is strong enough to lead them to buy stocks.

With the sole exception of sugar the same renewal of strength is evident in all the commodity markets. Cotton, which has been rather droopy as a result of the extension of the New England textile strike, is higher as this is written and, though trade may remain apathetic until the trouble is settled, the statistical position is too strong to allow much of a decline. Secretary of Labor Davis seems to think that the prospects of a settlement are much brighter, though he does not indicate what direction it may take. The coal strike has been utterly without effect on any market and the apathy with which the public regards it is the surest sign that it is beaten before it starts. Even though all union miners answer the strike call disintegration of their forces is likely to set in before a fortnight has passed. Old cotton merchants and stock traders are disposed to buy on strike news.

Industrial Improvement Continues

The advance in coffee bears out frequent predictions made in these letters and strengthens our confidence that sugar will go higher despite the reaction of the past week, which is simply one of the temporary recessions by which all upward movements are punctuated. The rapidity with which the surplus supply of sugar is being distributed is one of the most impressive examples the markets have ever shown of the effect of low prices in increased demand. Grains also are higher, though they have a long way to climb to regain the peak of a month ago.

While these markets are recovering from their hesitation, industrial improvement is unabated. Freight car loadings continue substantially above the levels of a few weeks ago and railway earnings so far announced for February indicate a net return for the Class I roads of close to $55,000,000, or less than $2,000,000 short of 6 per cent return contemplated in the Transportation Act. These figures reflect business which was initiated all the way from two to four months ago, when sentiment was less optimistic than it has been lately, and there are no indications of any decrease in buying since.

If figures on unemployment are any indication, other industries are going ahead in much the same way. In New York last week there was a demonstration of the extent of idleness which was intended to be impressive but turned out to be amusing. The Council of the Unemployed arranged a parade to call attention to the numbers who have no means of supporting themselves and more than a hundred policemen were detailed to care for the traffic arrangements. As a result there were about four policemen to each parader, for the crowd which finally turned up at the City Hall numbered twenty-eight men, not enough to carry the banners which had been prepared.

Both by sections of the country and by industries, reports show improving business and better prospects. Eugene Meyer, Jr., managing director of the War Finance Corporation, who is touring the West, is convinced that even the sheep and cattle growers are now in a position to operate profitably. Refreshing optimism comes from the agricultural implement trade and business improvement is reported from such divergent sources as Pacific Coast distributors, Southern grocers and the Kansas City Reserve Bank, which tells of increased buying power throughout the rich area which it serves and describes the outlook as the most encouraging in any time during the past two years.

There are many other specific items which are significant of the trend. Steel companies are obtaining higher prices without difficulty and the *Iron Age* states that March orders will show the largest total in nearly two years. Department store trade in volume, allowing for price declines, equals or exceeds last year's remarkable showing. The widespread building activity is a very encouraging feature of the situation. Increased orders for automobiles are reported from the West and the output has been gaining steadily since the first of the year.

The Foreign Outlook

Ratification of the treaties negotiated at Washington, the Irish peace, better prospect of a settlement in the Near East, and increasing possibility of an early recognition of Mexico, are important facets of the most favorable international outlook in months. If the Genoa conference yields anything of importance it will surprise most people in this country, but the opportunity is so great that Europe's statesmen may rise to it. The decline in marks to 0.0028¾ almost certainly heralds the quick ending of Germany's "catastrophe boom." Prices are said to have advanced 50 per cent since last fall and it is absurd to expect that the wage earners of Germany will much longer be willing to accept near-worthless paper in exchange for their labor.

Otherwise it has been difficult to find unfavorable items in the news of the week. John Moody states that "In all my experience in over 30 years in Wall Street, I never saw the stage so completely set for a constructive period such as I believe is ahead of us for the next year or two."

Business Conditions in England

BY OUR LONDON CORRESPONDENT

The lockout in the engineering trade has started. Confined at present to members of the Amalgamated Engineering Union, it cannot at the moment effect more than about 400,000 men and youths, nearly a quarter of whom would be out of work anyway. But it may perhaps affect the whole of the engineering and even the shipbuilding industries, and several of the unions have been given another fortnight in which to decide whether they will agree to the employers' terms regarding management, or join the skilled mechanics shutout. The dispute arose ostensibly on account of the working of overtime, but the employers' terms having been rejected by ballot in the course of which not one-quarter of the members voted, the leading engineering trade union was then faced with the lockout, with the certainty that the whole question of management would be raised and the almost sure prospect that wages and ordinary hours of labor would be revised. The condition of the industry as a whole is such that whether the works are shut or open will not make much material difference to the employers; they may lose less by shutting down than by keeping open. This applies mostly to the machine tool side but least to the electrical engineering section. On the other hand, the engineering trade union, like most of the other unions, has had its funds depleted as the result of a long spell of bad trade, and generally speaking is in no position to make a lengthy fight; in fact its only hope is to draw funds from other unions who may be in no better pecuniary position.

Idleness Decreasing

In the world outside engineering it really does seem that some improvement can be noted, as for the last five or six weeks the numbers of the unemployed have shown decreases, and some decline has been visible in the cost of living as officially calculated. The latest available figures show 1,837,233 persons registered as wholly unemployed, which is a decline of 97,000 in the last seven weeks; and 131,000 are on emergency work provided by the government and other authorities. Then too money has been easier and since the last letter was written the bank rate here has been reduced to 4½ per cent. With this decline the clearing banks reduced their deposit rate from 3 to 2½ per cent, this being 2 per cent below the bank rate as compared with 1 per cent below in the pre-war period.

The improved employment figures hardly apply to the engineering and metal trades, though in some districts more blast furnaces have been put into operation and the coal output has considerably improved; indeed the miners have been setting up records. But their wages have been reduced and the low rates in some districts have caused disquietude in the minds of people, both in and outside the industry, as it is recognized that even with commodities at pre-war prices the earnings could hardly provide a living of reasonable standard. As to shipbuilding, it has been estimated that work is in actual progress on only 28 per cent of the slips.

The machine tool industry certainly shows no improvement in trading conditions (one firm of machine tool merchants will shortly open a restaurant, using most of its showroom area for that purpose), and the depressing circumstances are reflected in the annual report for 1921 of the Machine Tool Trades Association. This report states that during the year twelve firms resigned, "nearly all in consequence of having ceased to be machine tool makers." The membership is put at 142, compared with the year previous which showed 162. This shows a decline, not of twelve as reported, but of twenty. Moreover, during the year previous six applications for admission were refused. The concerns who have withdrawn are not specified, but it is stated that one firm resigned after having been fined £100 for participating in an engineering exhibition organized by a Glasgow corporation. This exhibition policy has possibly led to the resignation of two or three other concerns, both makers and agents. One firm that has come out of the lists had previously been known as printers' engineers, and during the war entered the ranks of machine tool makers owing to circumstances, being then engaged in the production, by arrangement, of an American grinder and a lathe.

The report of the association gives no survey of the year but, as usual, contents itself with recording matters of domestic interest. One of the paragraphs relates to the fencing of machinery, members having been supplied with copies of a letter on the subject written by an inspector of factories in which they were "urged to make every effort to manufacture machines in such a way that they should be safe to operators." This subject naturally interests the British Industrial Safety First Association and the latest report provides an analysis of the causes of 317 deaths which occurred during a number of years as "issued by a prominent company." Apparently the accidents analyzed are not confined to a single industry. A point is that they show the deaths from mechanical causes to form 35.6 per cent, and from non-mechanical causes 64.4 per cent. Thus it is pointed out, supporting the statement made by the deputy chief inspector of factories here, that only about 30 per cent of all accidents involve machinery to any extent and that even with the fullest provision of safeguarding a decline of about 10 per cent only could be expected. At the annual meeting of the association, held in London on March 8, little of a technical character was discussed, the chief points raised relating to publicity matters. Individual members were undoubtedly cheerful, but the sombre character of the outlook was shown by the reference made by the president, Sir Alfred Herbert, to the prospects of the exhibition to be held by the association towards the end of 1924.

The small tool trade has been maintained better than the trade in machine tools, but of course not on anything like the ordinary scale. There can be little doubt that stocks to a considerable amount are still in hand, and this fact has been used in some instances as an inducement to buyers, on the ground that for the tools in hand no charges on account of safeguarding of industries duty will be made. By this duty of course measuring instruments become key industries and are subject to an import duty of one-third their value. The effect has been definite and has shown itself particularly in the case of some Swiss products where, in addition to the duty the exchange works to the disadvantage of the importer, sterling being quoted lower in Geneva than anywhere else. In certain lines, particularly micrometers, the competition offered by British manufactured goods may be regarded as negligble, and though a few firms have mentioned that they "would be shortly placing on the market, etc.," little that is tangible has resulted. Vandervell & Co., a firm of automobile fitting manufacturers is entering the small tool market and with a separate factory near Brighton, about 50 miles from the main factory, at Acton, W., produces calipers and similar implements, V-blocks and other aids to the engineering workman and to the toolmaker; but up to the present the micrometer has been left alone.

The usual order for small tools is of meagre proportion—a dozen twist drills being specified at a time by large firms —and the high-speed steel, etc., market experiences the same conditions. Stainless irons are common, but as applied to tableware—spoons, forks, etc.—seem to be too leaden in appearance. Rumors have concerned themselves with the sale here of German small tools, but the writer has had some difficulty in locating these and is disposed to think they have reference to pliers, combination tools and the like, rather than with the small tools of the machine shop.

Engineers To Co-operate

The various British technical institutions of engineers, including civil, electrical, mechanical, mining and so on, have always acted somewhat independently, the idea of each apparently being to form a self-contained unit with its own house and organization. Now as the result of a visit by engineers from America, the Institution of Civil Engineers agreed to call a conference to consider a closer connection, and the Institution of Mechanical Engineers at any rate will co-operate. The Institution of Electrical Engineers, it may be worth mentioning, has been celebrating its jubilee. For although it was founded in 1871, being then known as the Society of Telegraph Engineers, the first ordinary meeting was not held until February 28, 1872. The chief feature of the celebration was a series of discourses, chiefly by way of reminiscences of experiences in electrical engineering, one of the speakers being able to state that as a lad he attended certain of the lectures given by Faraday at the Royal Institution. Another feature of the program was a lecture by Prof. J. A. Fleming on "Michael Faraday" and the foundations of electrical engineering, demonstrated by experiments with much of the apparatus used by Faraday himself at the institution. The Institution of Electrical Engineers is the largest of the British technical societies, the membership now exceeding 10,000.

Chicago Letter

March business in the machine tool industry in the Chicago center has held its own in spite of the "see-saw" trend. Although the dealers as a whole have not yet arrived at definite figures, many of them have stated that March will prove as good if not better, than February which was a very good month. The outlook and business conditions appear to be improving throughout the entire country and trade activities in the iron and steel products market for the Chicago district are keeping pace.

Inquiries are growing in number but many are for small and miscellaneous machinery. One of the most extensive lists is that issued by the U. & J. Carburetor Co. That company was burned out by the recent disastrous fire near the machine tool district and is looking for a new factory location. The temporary location of the firm is 510 West Van Buren Street.

Railroads are still inactive with the exception of the Santa Fe which is inquiring for the following: One 500-ton double-end hydraulic wheel press; one 90-in. motor-driven, driving wheel lathe; one heavy-duty double-end car axle lathe with motor drive; one 300-lb. Beaudry hammer; one 52-in. car wheel lathe; one 4-ft. radial drill, and one 15-ton crane.

Activities in the crane market in this center are also optimistic. Among the recent orders booked by a local firm are two 40-ton cranes for the Sterns-Rogers Co., Denver, Col.; three cranes for the Coshocton Iron Co., Monongahela City, Pa., one each 10, 5 and 2-ton. This same firm is also active in the foundry machinery market and recently received an order for thirty-six tumbling barrels, and nine No. 8 cupolas from the Ford Motor Co.

A very nice word of optimism comes from the report of the seventh district of the Federal Reserve Bank, that the per cent change in the machine tool employment situation since a year ago shows a decrease of 12.5 per cent. This figure is 27 points smaller than that of last month.

It is understood that the Illinois Central R.R. purchased 15,000 tons of rails. The Chicago, Burlington & Quincy received bids recently and is expected to award the contract soon for 1,000 tons of structural material for its new Chicago freight terminal. The Chicago, Rock Island & Pacific is receiving bids for 1,600 tons of steel for bridge construction.

Plans have been drawn for a one story plant, 120 x 180 ft. to be located at 4603-19 Fullerton Ave. Henry Newgard & Co.. 947-55 West Washington St., manufacturer of electrical specialties, is the owner. The cost of plant and equipment will amount to $75,000, it is estimated.

Black & Decker Declare Dividend

The Black & Decker Manufacturing Co. has just declared a dividend for the first quarter of this year at the rate of 3 per cent on the preferred stock. The company set its sales quota for this year a half million dollars higher than the actual sales last year and for the first quarter of this year it advises that 100 per cent of this quota has been made.

Idle Freight Cars Total 216,661 on March 15

Freight cars idle because of business conditions on March 15 totaled 391,797 compared with 398,982 on March 8, a decrease of 7,185, according to reports just received from the carriers of the country by the car service division of the American Railway Association.

Of the total 216,661 were surplus freight cars (cars in good repair and immediately available for use if traffic conditions warranted) while the remaining 175,136 represented freight cars in need of repairs in excess of the number normally regarded as being unfit for service owing to their condition.

Surplus coal cars in good repair numbered 79,803, a decrease within a week of 6,661 but owing to a falling off in the loading of grain principally in the Northwest, an increase within that period of 382 cars was reported in the number of surplus box cars, the total being 89,356. Surplus coke cars amounted to 2,561, a reduction of 899 within a week while a decrease of 138 was reported for stock cars which totaled 19,739.

Engineering Advertisers Elect Officers

At the annual meeting of the Engineering Advertisers' Association held recently in Chicago, Julius Holl, advertising manager of the Link-Belt Co., was elected president. J. B. Patterson, of the P. H. & F. M. Roots Co., was chosen vice-president. The new secretary is H. N. Baum, of the Celite Products Co., and the treasurer is C. H. Connell, of the Weller Manufacturing Co.

Mr. Holl, the new president, has been with the Link-Belt Co. for ten years. During the war he was head of the publication section of the Emergency Fleet Corporation and was later assistant to the Director General of that body.

Elimination of Waste Effective in Many Countries

Millions of dollars can be saved to the nation by the elimination of waste in industry, L. W. Wallace, of Washington, executive secretary of the American Engineering Council of the Federated American Engineering Societies, declared at a joint meeting of the Chicago Chapter of the Society of Industrial Engineers and the Western Efficiency Society at the Auditorium Hotel in Chicago, recently.

Mr. Wallace, who as vice-chairman directed the nationwide assay conducted by the Hoover Committee on Elimination of Waste in Industry, said that the publication of the Committee's report was "an event that will be far-reaching in its beneficial effects on industry, not only in the United States but throughout the world." He added that engineers and industrialists were coming to agree with Secretary Hoover that the opportunity for advance in living standards in this country lies more surely in the steady wiping out of industrial wastes than in great inventions.

Mr. Wallace said that the Hoover Committee's findings had already borne fruit in Europe as well as in America. Inquiries have already been set on foot by governments and private industry in other nations and the Republic of Czecho-Slovakia has officially distributed the report as a guide for its industrialists in the upbuilding of the new nation's manufacturing enterprises.

In the United States, results of the committee's work are now evident in the building trades, printing trades, metal trades and boot and shoe, textile and ready-made clothing trades.

Edward P. Maguire Dead

Edward P. Maguire, general manager of the Lapointe Machine Tool Co., of Hudson, Mass., died on March 28. Mr. Maguire had been connected with the Lapointe interests for many years and was general manager since 1914.

Machinery Exports Fall Down in February

The increase in metal-working machinery exports was short lived. The value of February exports was $715,245, a decrease from $925,825 in January. The value of exports in February, 1921, was $2,781,781. The detailed figures, which are those of the Bureau of Foreign and Domestic Commerce, follow:

EXPORTS OF METAL-WORKING MACHINERY

	—February, 1921—		—February, 1922—	
	Number	Value	Number	Value
Lathes		$442,491	44	$35,521
Boring and drilling machines			127	36,212
Planers, shapers, and slotters			10	12,073
Bending and power presses			12	103,135
Gear cutters			251	3,583
Milling machines			27	23,791
Sawing machines			28	7,735
Thread-cutting and screw machines			43	8,011
Punching and shearing machines			21	38,579
Power hammers			48	8,871
Rolling machines			1	189
Wire-drawing machines			6	60
Polishing and burnishing machines			4	1,853
Sharpening and grinding machines		148,410	786	65,211
Chucks, centering, lathe, drill and other			1,455	13,112
Reamers, cutters, drills, and parts for machine tools			100,735	82,556
Pneumatic portable tools			278	21,242
Foundry and molding machinery			127,883	14,230
Other metal-working machinery and parts thereof		2,190,880	795,341	239,281
Total metal-working machinery		2,781,781	.....	715,245

Thirty machine tools, valued at $13,763, were imported in February. In February of 1920 the number of machine tools imported numbered 271 and their value was $29,633. During the eight months ended with February, there have been 2,583 machine tools imported, valued at $115,338.

War Department Disposes of Remaining American Tools in Belgium

Only a Few Tools on Hand and Most of Them Incomplete—Deal with La Construction Metallique Reflects Credit on Our Sales Organization

By C. E. CARPENTER
President, C. E. Carpenter Co., Société Anonyme, Paris

The United States War Department's stock of machine tools in Belgium has been purchased by E. R. Frederick, who for the past two and a half years, has represented the Director of Sales in connection with the shipment of War Department surplus machines to Belgian manufacturers.

It will be recalled by readers of AMERICAN MACHINIST that shortly after the armistice an agreement was entered into between the Director of Sales and a syndicate of Belgian manufacturers, known as La Construction Metallique, whereby the United States War Department undertook to supply the machine tool requirements of Belgian manufacturers out of its surplus equipment on the basis of 1914 prices plus 55 per cent, less a graded amount for depreciation depending upon the condition of the machines.

An American army officer, Lieut. J. F. Ostertag, a machine tool expert, was assigned to duty with the Construction Metallique to ascertain the needs of the Belgians and under this agreement, approximately 2,200 machine tools were ordered from the War Department and delivered in Belgium during 1920 and 1921. These machines were of great assistance to Belgian industry. The transaction, it can be claimed, was equally advantageous to the American machine tool industry, since it discouraged importations of machines from Germany and introduced into Belgium many makes and types of American machines which might otherwise not have become known there except through years of patient missionary effort.

NINETY PER CENT OF TOOLS SATISFACTORY

Less than ten per cent of the machines shipped to Belgium were found to be unsuited to the needs of the Belgian manufacturers who specified their requirements. This is a remarkable record when it is considered that the War Department of a government is not supposed to be equipped to carry on a business in a highly technical article like machine tools, and, particularly, when it is considered that the machines in question were probably brought together from plants situated all over the United States, with all the attendant difficulties in the shape of examination, appraisement, inspection, shipment and packing.

The policy adopted by the Director of Sales in the case of machines that did not meet the requirements of the Belgian buyers was a wise and liberal one that reflected great credit both on the United States Government and on the officials who negotiated the transaction and carried it through to completion. All machines that were not satisfactory were taken back by the Government and stored in the American Army Base warehouses in Antwerp. It is this machinery that has just been sold "en bloc" to Mr. Frederick, who plans to dispose of it not only in Belgium, but wherever the market calls for such equipment.

Altogether, about 180 machines are involved in the deal, about half of them being lathes from 16 to 30 in. swing and 6 to 20 ft. beds, the makers' names including Leblond, Whitcomb-Blaisdell, Fulton, Reed-Prentice, Canada, National, Wickes, etc. Next in importance to the lathes are turret lathes, made by Gisholt, Foster, Warner & Swasey, Libby and Steinle. There are also a number of automatics of Gridley, Acme, Cleveland, New Britain and Cone types, and a few grinding machines made by Norton, Fitchburg, Bryant, Diamond, Sellers and Blanchard. The single Blanchard grinder is a No. 16 with motor on spindle, the motor being wound for 60 cycles, whereas the Belgian practice is 50 cycles. There are several sensitive radial drilling machines, made by Carlton and Hammond, but no other types of drilling machines and no milling machines with the exception of two Ingersoll slab millers, two or three hand milling machines, a number of one- and two-spindle profiling machines and several thread milling machines for internal work.

SOME MACHINES INCOMPLETE

Among the miscellaneous machines that complete the list are two 48-in. Putnam planers, a Cincinnati 24 in. x 4 ft. crank planer, several Pratt & Whitney spline milling machines, three or four Toledo and Ferracute presses, a Beaman & Smith two-spindle horizontal boring machine, one Rockford horizontal drilling machine, a No. 60 Heald cylinder grinder and several Pratt & Whitney shaving machines.

Many of the machines are incomplete and will require new parts from America to fit them for work. The 24-in. Gisholt turret lathes, for example, are without side carriages and possess no tools. The Warner & Swasey No. 2 and No. 4 turret lathes are likewise without side carriages and bar feed mechanism. Incomplete machines are, of course, useless to the average machine shop, and as no one in Belgium has up to the present made a practice of reconditioning machine tools it is quite likely that these incomplete machines will eventually have to be sold at very low prices to buyers willing to assume the risk and expense of completing them.

The price at which the machines were sold to Mr. Frederick is not known, but undoubtedly it was based upon the present stagnant condition of trade in Belgium and upon the realization that much of the equipment in its present state is useless except to those prepared to try it with the full knowledge that many parts will have to be made here or imported from the United States. The sale will likewise free the American Army Base warehouses in Antwerp of several hundred tons of cumbersome material and reduce the military operating expenses in that part.

Prior to entering the employ of the Director of Sales of the United States War Department in 1919, Mr. Frederick was president of the Allied Machinery Company de France, of Paris the French subsidiary company of the Allied Machinery Company of America.

Progress Report of Standards Body

Important developments that have taken place in the movement to nationalize engineering and industrial standards are set forth in detail in a report now being issued relating to the work of the American Engineering Standards Committee during 1921.

The activities of the committee have developed to such an extent that work is now under way on seventy nine distinct projects which have reached an official status. In their work, 160 bodies of national importance are co-operating, these having designated more than 500 individuals as official representatives to serve on sectional committees working under the auspices of the committee.

During 1921 the committee approved standards for seventeen different projects. A list of seventy-nine projects remains to be developed during the coming sessions. This list will be supplemented by other standards as soon as the work is systematized.

Among the standards approved during 1921 were: Specifications for portland cement, soft or annealed copper wire, copper wire, bars, cakes, slabs, billets and ingots, electrolytic copper wire bars, etc., cold-drawn bessemer steel automatic screw stock, cold-drawn open-hearth steel automatic screw stock; standard methods of testing distillation of bitumunious materials for road treatment, sampling of coal, assay of copper, chemical analysis of manganese bronze and gun metal; safety codes for protection of heads and eyes of industrial workers, national electric code and industrial lighting code; and a standard test for toughness of rock.

A statistical summary included in the report is interesting. It contains the following data: Member bodies, 20; organizations represented, 28; representatives on main committee, 52; approved standards, 17; standards up for approval, 17; projects having official status, 79; projects for which sponsorship has been accepted, 51; organizations acting as sponsors, 43; co-operating bodies, 160; individuals on sectional committee, 548.

The report also contains a list of the committee members, participating organizations and the constitution and rules of proceedure of the committee.

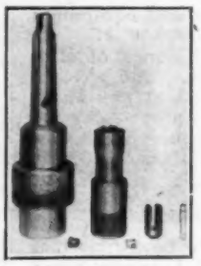
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Chuck, Drill, Quick-Change, Positive, Safety

SaveAll Tool Co., 59 River St., Waltham, Mass.

"American Machinist," December 1, 1921.



The chuck has a safety device to prevent breaking and burning of drills, taps, reamers and counterbores, and it consists of the chuck body, collet, ejector, shearing pin and jaws. The collet holds the drill and slips into the chuck. It has a solid bearing surface at each end and a lock for automatically taking up wear and eliminating end motion. The ejector in the small end of the collet releases the drill. The collet is driven by a renewable soft steel pin, which shears off when the cutting tool is overloaded. The capacity of No. 2 chuck is ¼ to 2-in. taper-shank drills, i. e., Nos. 1, 2, 3 and 4 Morse tapers.

Joint, Universal, Adjustable, "American"

Hartman Manufacturing Co., 308 Pearl St., Hartford, Conn

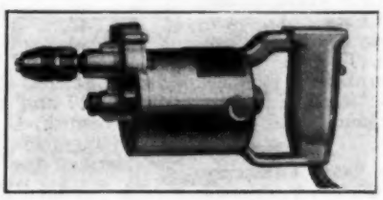
"American Machinist," December 1, 1921.

The joint is intended to transmit relatively large powers. A ring surrounds the forks and carries the hardened steel studs, which have tapered bearings in the fork ends. This ring is in two parts, so that the joint may be assembled or disassembled, and adjustments made to compensate for wear. An annular oil chamber within the ring holds a large supply of oil. The sleeves also are split, and may thus be applied to shafts without disturbing the endwise position of the latter. The castings are bronze, but may be supplied in malleable iron or steel. The joint is made in all commercial sizes for shafts from ⅝ to 2 in. in diameter.

Drill, Electric, No. 3

Lovejoy Tool Works, 319-331 West Ohio St., Chicago, Ill.

"American Machinist," December 1, 1921.

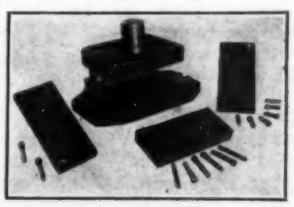


The drill has a capacity for drilling ¼-in. holes in steel. It weighs only 4 lb. and is furnished with either a 110 or 220-volt motor suitable for direct or alternating current. The switch is conveniently placed and is operated by the thumb. The drill has ample ventilation and provision for oiling, and is driven through a bronze gear.

Punch and Die, Standard Sets

Diamant Tool and Manufacturing Co., 91-97 Runyon St., Newark, N. J.

"American Machinist," December 1, 1921.

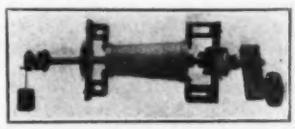


The sets are made in five sizes capable of a large number of combinations, to save the purchaser's time in making patterns and castings. The die sets are furnished complete with the exception of the die openings and the holes for inserting the punches in the punch plate. Screw holes are drilled and countersunk and all screws and dowels required are furnished. The die blanks are of oil-hardened steel and are from 0.006 to 0.010 in. oversize to allow for shrinkage in hardening and for final grinding.

Boring Bar, Taper, Portable

Pedrick Tool and Machine Co., 3638 North Lawrence St., Philadelphia, Pa.

"American Machinist," December 1, 1921.

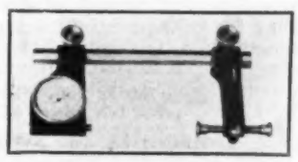


The bar is adaptable to boring holes with any degree of taper, as well as to facing the hub on work too large for a machine. The tool is shown set up for boring a cylindrical casting, that serves as a support for the crossheads holding the boring bar. Each crosshead has four setscrews for adjusting and aligning the bar after centered in the hole. The taper is derived from a cross-slide and yoke, the degree of it being controlled by the distance the slide is moved from the central axis. The driving gear is stationary. The feed case, shown with a weighted handle, provides a constant and automatic feed.

Caliper, Indicating, Extension-Beam

F. W. Horstman Co., 196 Colt St., Irvington, N. J.

"American Machinist," December 1, 1921.

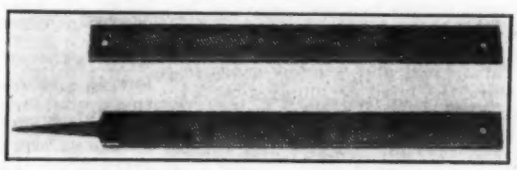


The caliper may be used on a lathe for gaging across the face of chucked work, and on a planer for duplicating wide pieces. By reversing the arms on the beam, the tool becomes an inside indicating caliper, and can be used in any size hole above 4¾ in. The dial is graduated in thousandths of an inch, so that the operator may see directly the size of the work in relation to the desired size. The rear surfaces of the arms are flat, and, when laid on a plane surface, keep the plunger and adjusting screw in alignment. The beam is ordinarily 6 in. long and ¼ in. in diameter, although any length can be furnished.

File, "Hygrade Hand Miller"

Steele-Sayward Co., 79 Milk St., Boston, Mass.

"American Machinist," December 1, 1921.



The teeth of the file are milled instead of being forced up by the usual process of file cutting. It is claimed that the process of forming the teeth does not harm the grain structure of the steel; that the steel is especially heat-treated to give maximum hardness and toughness to the teeth; that the tool works equally well on all metals and alloys, and that when used on lead, solder or babbitt the teeth do not become clogged. The files can be furnished in either the blade or the tang type.

Hoist, Electric, "Lift About"

Shepard Electric Crane and Hoist Co., Montour Falls, N. Y.

"American Machinist," December 1, 1921.

The electric hoist is applicable to all load-moving jobs and can be installed wherever a chain block might be used, providing that electric current is available. The motor is especially designed for hoisting service, and can be furnished for either direct or alternating current.

Clip, paste on 3 x 5-in. cards and file as desired

Business Outlook in Foreign Markets

Reports coming to the Department of Commerce from foreign countries provide an accurate barometer of business conditions abroad and indicate to American manufacturers where their best markets lie. Dr. Klein, director of the Bureau of Foreign and Domestic Commerce, at Washington, stated recently that his department is receiving an average of 600 inquiries per week from business men regarding Latin-American markets. This indicates a growing interest in Latin-American business and disproves the reports that Germans have secured these markets to the exclusion of all other countries.

Developments in the Far East are also encouraging. The Shanghai market for steel products is generally quiet but the demand for tin plate and wire nails is noticeable. By the failure of German concerns to deliver steel products according to contract, American firms are placed in a strong position. Contracts which were concluded in China by the Germans last year for the erection of cement plants evidently called for German machinery equipment as quantities of such machinery are now being shipped to that country. German automobiles have also appeared in China, the first since pre-war days.

Competition too Strong

In Australia the Newcastle Steel Works, owned by the Broken Hill Proprietary Co., will be entirely shut down this month. It is said by officials that the production cannot compete with the following steel prices in England and in other countries. Reports are current that the Commonwealth government's merchant marine may be sold to private operators.

The Belgian industrial situation during the past month has been marked by decreased orders, falling prices, wage reductions and increased fuel stocks. The metallurgical and window-glass industries are the most seriously affected. All grades of pig iron have declined 5 francs per ton since Feb. 15. Owing to the reduced foreign demand and somewhat increased production, semifinished steel, both bessemer and open-hearth, have generally declined about 35 francs per ton. Most varieties of finished iron and steel likewise registered reduction varying from 1 to 2 francs per hundred kilos, while under pressure from British and Luxemburg competition the decline on sheets was more marked, ranging from 4 to 8 francs per hundred kilos. American competition in wire nails resulted in reduction of 1s. per hundred kilos in Belgian export prices. On March 1, twenty-two blast furnaces were operating, with a production of 400 tons of foundry iron and 3,215 tons of basic pig per 24 hours. This compares with eighteen blast furnaces in operation on Feb. 1, producing 646 tons of foundry iron and 2,470 tons of basic pig per 24 hours. Of the larger plants, the Ougree-Marihaye has four blast furnaces in operation; Usines de la Providence, two; and the S. A. John Cockerill, two. The latter plant has halted all steel-producing installations and is concentrating on the construction of a large, modern rolling mill which it is hoped to have ready for operation by October. Some of the iron and steel firms are planning to have extensive exhibits at the Rio de Janeiro exposition. A 90-ton express locomotive will be shown by the Cockerill Co.

In Spain the government is expected to refuse the railroads further increases in rates as the earnings have been very satisfactory the past year. The Norte Railroad earned 29,600,000 pesetas in 1921, which will allow a dividend of 57 pesetas per share. This company is issuing bonds for repair and equipment to the amount of 50,000,000 pesetas. In a recent session of the Council of Ministers it was resolved that the government would abandon, after April 1, the practice of extending state aid to the railroads, which during the current fiscal year has averaged about 7,000,000 pesetas a month.

Zeppelin Dirigibles

It is reported that the new dirigibles for the service planned between Spain and South America will be constructed in Spain under the direction of engineers sent by the Zeppelin Co. Aerodrome space has been secured near Seville and near Buenos Aires, and it is expected that within a month work will begin on the sheds. The Minister of War was granted a supplemental credit of 65,834,219 pesetas on Feb. 14. In addition he has solicited a credit of 17,500,000 pesetas for aviation, and it is planned to create ten squadrons with eighteen machines each. In addition six large bombing planes will be secured and necessary hangars constructed. The Minister of Marine is negotiating for the purchase of hydroplanes in England and dirigibles in Italy.

Business Items

The Sandvick Steel Co., Inc., has combined its general steel and steel belt conveyor departments in the one office at No. 2001, Woolworth Bldg., 233 Broadway, New York City. The following officers are now established in these quarters: W. D. Thomas, president and general manager; Anders Johnson, vice-president; G. M. Spencer, secretary; Harry Carlson, sales manager.

The Wunsch & Ter Kuile Company has been organized with offices and warehouses at 302 McDougal St., Brooklyn, N. Y. The new company will act as selling agents for manufacturers of material handling machinery and industrial engineering equipment. Mr. Wunsch is the founder of the Silent Hoist Co., and Mr. Ter Kuile was formerly engineer with the E. I. du Pont de Nemours & Co.

The Weed Engineering Works, Inc., Bridgeport, Conn., was recently incorporated under Connecticut laws to manufacture metal products, tools, machinery and miscellaneous devices. The capital stock is $25,000 and the incorporators are: Fred R. Carstensen, Nichols, Conn.; Lorenz F. Carstensen, 72 Fifth St., Bridgeport; and H. W. Carstensen, of Nichols.

Davis Welding and Manufacturing Co., of Cincinnati, Ohio, manufacturer of truck tanks, storage tanks and seamless cans, has opened branch offices in the American National Bank Bldg., San Francisco. The company will introduce in Pacific Coast territory a standardized truck tank body for carrying gasoline and oil, which body is claimed to posses safety features that largely eliminate fire hazards. C. F. Chambers, Pacific Coast manager for the company, will make his headquarters in San Francisco.

The Columbia Foundry Co., of Columbus, Ga., has been consolidated with the W. L. Lemley Foundry Co., of Bessemer, Ala. The soil pipe plant of the Columbia company is to be moved to Bessemer.

An Interstate Commerce Commission examiner has recommended that the rate on bulk coke from Tupelo, Miss., to Atlanta, Ga., is unreasonable, in deciding the complaint of the Pratt Engineering and Machine Co.

Advances in aid of exports made by the War Finance Corporation from Jan. 4 to March 11 of this year include $470,966 for sugar mill machinery and $500,000 for agricultural machinery.

The Lyons Level and Tool Co., of New Haven, Conn., manufacturer of levels and tools, recently changed the name of the concern to the Lyons Manufacturing Company, and filed a certificate for an increase in capital stock from $50,000 to $150,000.

The Hartford Blower Company, 618 Windsor Ave., Hartford, Conn., has recently filed papers of incorporation with the Secretary of State, to manufacture and deal in blowers and fans. The officers chosen are: President, George W. Christoph; treasurer, Robert A. Briggs; secretary, George W. Christoph, Jr.

The Steel Co. of Canada, Ltd., reports, for the year ended Dec. 31, 1921, a net income of $817,292, which, after deducting preferred dividends, is equal to $3.15 per share on the common stock, compared with a net income of $1,855,404, or $12.19 per share in 1920.

The plant of the Sinker-Davis Company, of Indianapolis, Ind., manufacturer of boilers, engines and saw mill machinery, was badly damaged by fire recently.

The All-Metal Valve Co., has been organized at Detroit, Mich. Capital stock is $200,000 and incorporators are F. L. Klingensmith, C. Nalinz and F. Beall. Mr. Klingensmith was formerly vice-president of the Ford Motor Co.

The Bernard E. Mohr Machinery Co., of St. Louis, Mo., has moved from Easton Ave. to 1213 Pine St.

The Bryan Harvester Co., Peru, Ind., manufacturer of steam tractors, has bought the real estate and holdings of the Weigle Machine Tool Co., the buildings of which adjoin the harvester company's property. The new property will be used for storage and assembling of tractors. The new tractor recently completed is a three-plow puller, and has 100 horsepower.

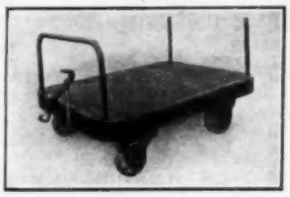
The Tool Equipment Sales Co. has been organized at Chicago, Ill., with sales offices at 18 South Clinton St. Jesse B. Alton and C. B. Cole are the owners. The company now represents the Alvord Reamer and Tool Co., of Millersburg, Pa., and the Standard Saw and Tool Manufacturing Co., of Boston, Mass.

The Edward Hollander Tool Co., 142 Miller St., Newark, N. J., has just been organized to manufacture the Hollander adjustable broach. The product will be sold through dealers as well as direct.

Condensed-Clipping Index of Equipment

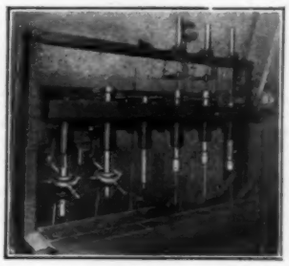
Patented Aug. 20, 1918

Trailer, Heavy-Duty, "Brute"
Sharon Pressed Steel Co., Sharon, Pa.
"American Machinist," October 6, 1921



The trailer can be pulled by an industrial tractor or motor truck. It is intended for carrying heavy loads, and cannot be easily tipped. The frame is made of pressed steel, the outer members being 4⅜ in. channels of ¼ in. steel. It can be made in any length up to 72 in. and width up to 50 in. The rear wheels are made of malleable iron, and have 3 in. Hyatt roller bearings. The front casters are bolted to pressed-steel stampings and equipped with ball and roller bearings. The top is of oak, with the edges placed under the rails. The truck can be equipped with one or two couplers. It weights 362 pounds.

Operator, Nut-Tapping Machine, Automatic, Air-Operated, "Clay"
Key Boiler Equipment Co., East St. Louis, Ill.
"American Machinist," December 8, 1921

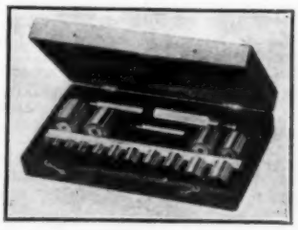


The device controls the rise and fall of the spindles and feeds the blank nuts into the tapping position. As soon as a nut is tapped, the spindle and tap are raised, carrying the tapped nut on the tap, and another nut is fed into position and the tap lowered into it. When the tap shank is filled with tapped nuts, the spindle rises to be removed and emptied. The regulating and feeding mechanism take care of all sizes of nuts within the capacity of the machine. This attachment can be applied to all makes of machines.

Grinder, Tool, Electric, "Dimo"
Luther Grinder Manufacturing Co., Milwaukee, Wis.
"American Machinist," December 8, 1921

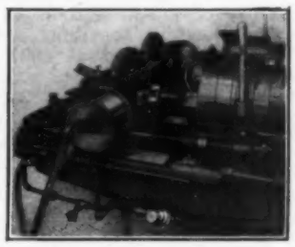
The machine is for use in manufacturing or repair shops where electric current is available. The motor is dust proof, and runs in S.K.F. bearings. The arbor is rigid, and allows considerable space between the bearings and the wheels. Dimo-grit wheels are used. The grinder can be furnished with either a high or low pedestal, and also with toolrack and guards. The machine is built in five sizes with either single-phase motors for 110 or 220 volts, or two or three-phase motors for 110, 220 or 440 volts. It can be furnished for belt drive if desired.

Gages, Plug, Standard, Leonard
Coats Machine Tool Co., Inc., New York, N. Y.
"American Machinist," December 8, 1921



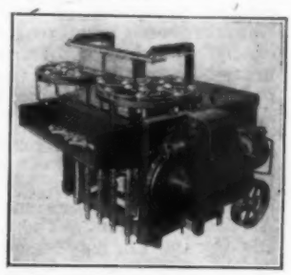
The gages are fitted with renewable heads, are made of hardened steel, and are guaranteed accurate to within 0.0001 in. of nominal size. The No. 1 standard set comprises 14 sizes from ¼ to 1¼ in. The No. 2 standard set comprises sizes from 1⅜ to 2½ in. Renewable limit plug gages can be supplied in various sizes in English or metric units to any given limits, in sets or singly. Standard ring gages are made from ¼ to 6 in. in size, to cover the same range as the plug gages. Any of the Leonard tools can be supplied.

Operator, Bolt-Cutting Machine, Automatic, Air-Operated, "Clay"
Key Boiler Equipment Co., East St. Louis, Ill.
"American Machinist," December 8, 1921



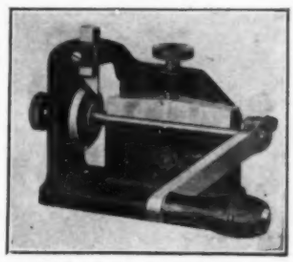
This device can be applied to all makes of machines. It clamps the work, feeds it into the dies, opens the dies after the thread has been cut, returns the carriage to its starting position and closes the dies for the next cut. The finished bolt is ejected from the holder, thrown clear of the machine, and another bolt pushed in from the magazine. When the starting lever is pulled by the operator, the movements are repeated. If the machine has a lead screw, the device can cut a thread with a continuous lead on the opposite ends of a bolt. For threading square or hexagon-head bolts from ⅝ to 1⅛ in. in diameter, a special feed and ejector can be furnished.

Heater, Rivet, Electric, Portable
United States Electric Co., New London, Conn.
"American Machinist," December 8, 1921



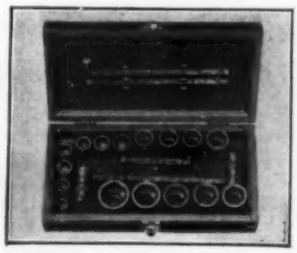
This machine can be used in shipyards, boiler and car works, and in any steel construction. It is built with two, four, or six electrodes for manual operation, or with an automatic movement for carrying the rivets between the electrodes and discharging them when heated. The automatic machine is illustrated. In the manually operated machine the electrodes are opened by pedals and closed by heavy coil springs. The machine is provided with casters, and with eyebolts for picking it up. It is furnished for 220, 440, or 550-volt, 60-cycle, single-phase alternating current, or may be specially constructed for other voltages and frequencies. It is 33 in. in height, 22 in. in length, and varies in width according to the number of electrodes.

Tool, Valve Facing, Adjustable
New Britain Tool and Manufacturing Co., New Britain, Conn.
"American Machinist," December 8, 1921



This device for resurfacing automobile engine valves will handle poppet valves of any commercial size of stem, and is designed for the use of individual automobile owners. The valve stem rests in a long V-groove and is held down by a flat steel shoe bearing on top of the stem, giving a three-point bearing. The valve is rotated by a crank handle. A screw is used to regulate the pressure on the stem. The removable cutting tool has an edge accurately ground to the original angle of the valve. The upper surface of the valve abuts against the screw at the left, by means of which the valve is fed to the cut.

Wrenches, Socket
Viking Specialty Co., 25 Bartlett St., Worcester, Mass.
"American Machinist," December 8, 1921



The wrenches are put up in sets of various combinations for automobile work. The general service set comprises a double-end ratchet wrench, sixteen sockets for hex-head screws and nuts, three extensions and a handle. The extensions and handle are fitted with ball frictions to prevent the sockets from slipping off. They are also put up in factory sets for shop assembling work, and in owners' sets to fit the bolts and nuts on any particular make of car.

Clip, paste on 3 x 5-in. cards and file as desired

Personals

GEORGE A. DAVIES, formerly with Wickes Bros., Saginaw, Mich., is now in Los Angeles. He is looking for good lines of machine tools to represent in the Western territory. At present he may be reached at 1031 S. Gramercy Drive.

P. R. HOOPES has severed his connection with the Automatic Machinery and Equipment Co., of Philadelphia, Pa., and is now associated with Lorenz & Lorenz, of Hartford, Conn., as mechanical engineer.

FRED MATHEWS, formerly vice-president of the Union Metal Products Co., has been appointed general railway sales representative of the A. O. Smith Corporation, manufacturer of pressed steel products, of Milwaukee, Wis.

O. B. ILES, general manager and treasurer of the International Machine Tool Co., Indianapolis, Ind., has been elected president of the Indianapolis Chamber of Commerce. Mr. Iles recently served as chairman of the committee on revision of the constitution of the National Machine Tool Builders' Association.

J. C. MILLER, manager of the Columbus, Ohio, division of the American Rolling Mill Co., has been transferred to Ashland, Ohio, as manager of the Ashland division. The Ashland Iron and Mining Co. was recently taken over by the American Rolling Mill Co. In a recent organization of the Ashland Coal and Iron Railway Co., also owned by the American Rolling Mill Co., Mr. Miller was elected first vice-president and general manager.

ELMER W. DE VED has been appointed manager of the stock department of the Yale & Towne Manufacturing Co., Stamford, Conn. Mr. De Ved has been with the company since 1897.

F. G. VALPEY, has recently accepted a position as sales manager of the Kenloc Manufacturing Co., Providence, R. I., manufacturers of special machinery and roll covering equipment. Mr. Valpey, was formerly sales manager of the Frank Mossberg Co., Attleboro, Mass.

JOHN F. TINSLEY, vice-president and general manager of the Crompton & Knowles Loom Works, Worcester, Mass., returned to this country recently after a two months' tour of the European countries. Mr. Tinsley, was accompanied by Irving H. Verry, also a vice-president of the Crompton & Knowles Co.

HENRY C. M. THOMSON was re-elected president of the American Hardware Co. at the annual meeting of the stockholders, held last week in New Britain, Conn.

CHARLES GLOVER has resigned as first vice-president of the American Hardware Co., New Britain, Conn., after serving that concern for forty years.

HOWARD S. HART has been elected to the board of directors of the New Britain Machine Co., New Britain, Conn. Mr. Hart is chairman of the board of the Hart & Cooley Manufacturing Co., and also of the Fafnir Bearing Co.

FRED W. HOWE, vice-president and sales manager of the Crompton & Knowles Loom Works, loom manufacturers of Providence, Worcester and Philadelphia, has booked passage for a three months' business trip in China and Japan.

CHARLES F. MARBLE, treasurer of the Curtis & Marble Machine Company, textile machinery manufacturers, Worcester, Mass., was recently elected a member of the executive committee of the Worcester branch of the National Metal Trades Association.

HENRY F. FAVOR, superintendent of the Providence, R. I., plant of the Crompton & Knowles Loom Works, sailed for China on March 16.

SYDNEY R. MASON, secretary of the Whitin Machine Works, Whitinsville, Mass., has sailed from San Francisco for a trip to Japan. Mr. Mason plans to return to this country in June.

J. H. WINDLE, sales agent of the Woonsocket Machine and Press Co., textile machinery manufacturers, of Woonsocket, R. I., has returned to this country after a six months' business trip in Japan and China.

W. C. MURPHY, treasurer of the Providence Mill Supply Co., Providence, R. I., returned to this country last week, after a six months' business trip in China and Japan.

Catalogs Wanted

Horace L. Smith & Co., Inc., Petersburg, Va., would be pleased to receive catalogs on wood-working machinery, lathes, shapers, drilling machines, power hacksaws and other metal-working machines for handling metal up to ¾ in. thick. The company is building a plant for manufacturing farm machinery and implements. Catalogs should be sent to Horace L. Smith, Jr., 1009 So. Sycamore St., Petersburg, Va.

Lefax, Inc., 9th and Sansom Sts., Philadelphia, Pa., would like to receive catalogs on all kinds of engineering materials and equipment.

Book Reviews

Proceedings of the Twenty-fourth Annual Meeting of the American Society for Testing Materials. Published by the society. Paper $10; cloth $11, and half leather $12.50; 1,197 pages 6 x 9 in.

In addition to the annual address of the president, George S. Webster, and the reports of thirty-one standing committees on various materials, the book contains tentative standard specifications for ferrous and non-ferrous metals; cement, lime, gypsum and clay products. Also for miscellaneous materials such as preservative coatings, petroleum products, lubricants, road materials, coal, coke, insulating materials, shipping containers, rubber products, and textile materials. The twenty-four papers presented at the meeting are given in full, together with discussions by various members. These papers contain valuable information on the results of investigations by experts in the field of engineering materials.

A Course in Mechanical Drawing. By Louis Roüillion, B.S., A.M., director Mechanics Institute, New York City. Norman W. Henley Publishing Co., 2, 4 and 6 West 45th St., New York. Cloth, ninety-two 6¾ x 7½-in. pages, thirty-five illustrations, $1.50 net.

This book is the result of a number of years' work in the instruction of evening classes and is intended for the use of students either at school or at home. The course covers a period of two school years of about twenty-four weeks each. As may be expected, the subjects are treated in an elementary way. Under the head of instructions a list of drawing materials and instruments required, their prices and use are given. The illustrations cover lettering, projection and isometric drawings all of which are accompanied by concise explanations and instructions. Under the head of notes on working drawings, directions are given for size of drawing sheets, titling, making sketches, laying out work, relation of views, sectioning, inking, dimensioning and blueprinting.

Report of the Fourteenth Annual Conference on Weights and Measures. Miscellaneous Paper No. 48, of the Bureau of Standards, Department of Commerce, S. W. Stratton, director. Complete copy of the paper may be purchased from Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 20 cents.

This publication, a verbatim report of the conference, contains addresses by the Secretary of Commerce, the president of the conference, and others. The papers and discussions deal with liquid-measuring devices, mine scales, railroad weighing of coal, and the metric system. Specifications and tolerances for liquid-measuring devices as amended are contained in the appendix.

Forthcoming Meetings

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary.

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham, Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Machine Tool Builders' Association: Spring convention, Hotel Traymore, Atlantic City, N. J., April 25 and 26. Ernest F. DuBrul, 817 Provident Bank Bldg., Cincinnati, Ohio, general manager.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

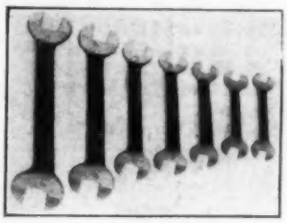
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Wrenches, Double-End

Mechanics Tool Co., Rockford, Ill.

"American Machinist," December 8, 1921



These wrenches are drop-forged from tool steel and oil tempered. The angle of the jaws makes it possible for the user to work in tight places and secure a firm hold on the nut or screw head without slipping. The opening in the larger end of each wrench is of the correct size to fit a U.S. standard nut, while the small end is made to fit an S.A.E. standard nut or bolt head. This feature makes the wrenches useful to the automobile mechanic. The set covers fourteen sizes of openings without duplication.

Vise, Hand, Pin

Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y.

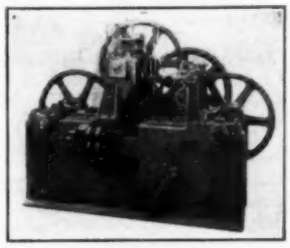
"American Machinist," December 8, 1921

The upper part of this device consists of a flat lyre-shaped spring and two movable jaws, both held together by a frame fitted with the clamping screw and knurled adjusting screw. These screws are provided with hardened pin ends, which project into the jaws and prevent them from sliding. A straight or tapered piece or one of irregular section, is gripped rigidly along the entire length of the jaws when the clamping screw is tightened. Long pieces extend through the hollow handle and are centered by means of the knurled adjusting screw.

Nut Pressing Machine, Hot, Automatic

Acme Machinery Co., Cleveland, Ohio

"American Machinist," December 15, 1921



A heated bar of special section is used, and the first operation indents it on both sides. The cut-off slide advances, shears off the blank and carries it into the die box. Two punches advance from opposite sides and go part way through the blank, compressing it in the center. The short punch retreats, while the piercing punch advances and punches out the core; and the nut is then ejected from the die. The machine is equipped with an automatic relief device. The indenting tools are operated from the upper shaft while the punches and cut-off slide are operated by the shafts at the opposite ends of the machine. The machine is built in four sizes: ⅜ to ¾ in., ½ to 1 in., ¾ to 1¼ in. and 1 to 2 in. The number of strokes per minute varies from 70 or 75 for the smallest to 35 or 40 for the largest machine.

Babbitting Fixtures, Ford Automobile Engine

New Britain Tool and Manufacturing Co., New Britain, Conn.

"American Machinist," December 15, 1921

The two fixtures are intended for repairing the main bearings and connecting rods of Ford engines. The main bearing fixture, shown in the upper view, can be set in place on the inverted cylinder block and positioned by the studs in the camshaft bearings. Crossbars hold the arbor central with relation to the bearings. The under-sized arbor allows stock for finish reaming the bearings. The connecting-rod fixture, shown in the lower view, consists of a flat base block of cast iron with two vertical studs and collars. The wristpin end of the rod, placed over the smaller stud, brings the crank end in proper relation to the larger stud, which is the babbitting arbor. The upper collar, pushed over the projecting end of the stud, bears against the rod. Recesses in the collars take care of the fillets. The bearing is finished when taken from the fixture.

Reamer, Line, Ford Crankshaft Bearing

New Britain Tool and Manufacturing Co., New Britain, Conn.

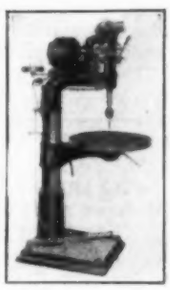
"American Machinist," December 8, 1921

This line reamer is especially constructed for reaming the crankshaft bearings of Ford automobile engines, and employs the same principle of expansible diameters and pilot blades as other reamers made by the concern. The blades are ground to a true circle for a distance equal to about one-third of their length from the entering end. This diameter follows the hole left by the babbitting fixture in the newly babbitted bearings. The range of expansion is from normal to about ⅛ in. oversize.

Drilling and Tapping Machine, Upright, "Electro-Magnetic"

W. Gaterman Manufacturing Co., Manitowoc, Wis.

"American Machinist," December 15, 1921

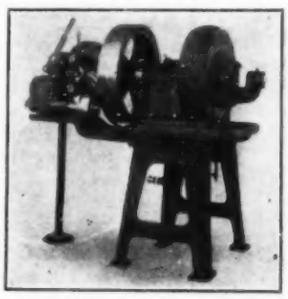


By this machine hand tapping can be automatically imitated. The tap is held in a floating spindle, which is driven through two coil springs, to avoid shocks and jars on the tap. The spindle automatically reverses for one-sixth of a turn when too great a torque is transmitted, and immediately takes up its original speed, which varies from 300 to 2,000 r.p.m., according to the size of the tap. The reversing action is accomplished by the spring balance in the drive and by electro-magnets. The machine can be furnished in different sizes, the No. 4 size having a range up to ¾ in. Either belted or motor drive can be employed. The machine can be set so as to run the tap to a certain depth and automatically return it.

Swaging Machine, Roller-Cage Type

Langelier Manufacturing Co., Arlington, Cranston, R. I.

"American Machinist," December 15, 1921

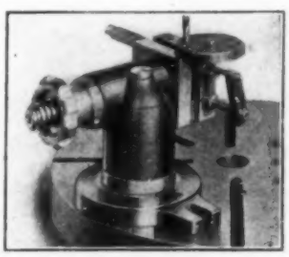


In this machine the rolls are carried in a floating ring or cage instead of being fixed in the head, and are made of a tempered carbon steel. A similar roll is carried in the outer end of each hammer block. A roll feeding attachment is mounted on the machine, to withdraw the work with a slow, even motion and give straightness and uniformity of reduction. The attachment has a capacity for stock from 0.375 to 1.313 in. in diameter. It is movable to and from the head through a distance of 5 in. by means of a screw underneath the baseplate. The flywheel is held to the spindle by a two-bolt clamping hub, closing over a key.

Vise, Combination, Drill Jig, Milling Fixture, Swiveling, Victor

W. B. U. Tool Co., 104 Harding St., Worcester, Mass.

"American Machinist," December 15, 1921



The device holds the work on a drilling machine, shaper, grinding machine or milling machine. The vise can be swung to change the position, both horizontal and vertical swivels being graduated to 360 deg. The fixture can be used on the bench when filing small dies and punches; or as a drill jig, for which it is equipped with a bushing plate having eighteen holes varying from 7/64 to ¾ in. in diameter. It can be set to drill round stock from ⅛ to 1 in. in diameter, and square or flat stock from ¼ to 1 in. thick. A V-groove is provided for the gripping of cylindrical work. The jaws have an opening of 2½ in., and can be furnished either soft or hardened.

The Weekly Price Guide

THIS WEEK'S MARKET

THE quotation of $1.40@$1.45 for structural shapes, plates and mild steel bars has very nearly disappeared from the market; leaving $1.50 per 100 lb. as the official Pittsburgh mill price. The gradual stiffening of the mill price has not as yet been reflected in warehouse quotations. Chicago warehouses, however, quote floor plates at $4.98 as against $3.40 per 100 lb.; but announce reductions of 25c. per 100 lb. on cold finished steel products. Pig iron, No. 2 foundry, shows slight upward tendency in price.

Electrolytic copper is quoted in New York warehouses at 13⅛c. as against 13⅝c.; tin at 29⅜c. reduced from 30¼. and lead at 5⅞c. as compared with 5c. per lb., one week ago. Zinc market steadier with quotations unchanged. Chinese antimony quoted in Chicago at an advance of ½c. per lb. Solder quoted in New York at drop of 1c. per lb. and babbitt metal also slightly reduced owing to recent declines in the tin market. Prices on old metals (non-ferrous) down about ¼c. per lb. in Chicago.

Linseed oil is quoted at 82c.@83c. as against 83c. in New York; at 90c. reduced from 97c. per gal. in Chicago.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.50
Northern Basic	21.02
Southern Ohio No. 2	21.54
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.16
BIRMINGHAM	
No. 2 Foundry	15.78
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	21.34
Virginia No. 2	27.74
Basic	21.00
Grey Forge	20.50
CHICAGO	
No. 2 Foundry local	20.00
No. 2 Foundry, Southern, sil 2.25@2.75	21.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	19.00
Basic	18.00
Bessemer	19.50

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	9.0	5.5	2.65
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	16.0	7.5	2.5
Denver	8.0	6.0	5.0
New Orleans	9.0	6.0	4.0
Minneapolis	9.0	6.0	4.5
New York	9.0	6.0	3.0
Cincinnati	5.0	4.5	3.75
Cleveland	6.75	4.5	2.6

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh. Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	3.75@3.90	3.75	4.15
Nos. 12 and 14.	3.10	3.85@4.00	3.85	4.25
Nos. 17 and 21.	3.40	4.15@4.30	4.15	4.55
Nos. 22 and 24.	3.55	4.30@4.45	4.30	4.70
No. 26	3.70	4.45@4.60	4.55	4.85
No. 28	4.00	4.75@4.90	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	⅜ to 1½	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.56	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	4.98
Cold finished shafting or screw	3.35	3.00	3.15
Cold finished flats, squares	3.85	3.50	3.65
Structural shapes (base)	2.48	2.31	2.38
Soft steel bars (base)	2.38	2.21	2.28
Soft steel bar shapes (base)	2.38	2.21	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.48	2.31	2.38
Bar iron (2.00@2.10 at mill)	2.38	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅜	8.50		12@13
⅛	7.15		11@12
5/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			13.50
Tin, 5-ton lots, New York			29.62½
Lead (up to carlots), St. Louis, 4.75; New York			5.10
Zinc (up to carlots), St. Louis, 5.02½; New York			5.37½
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.00	6.50	6.25
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.25	15.00	15.75
Brass wire (carlots)	16.75	16.50	.....
Zinc sheets (casks), (8% dis. carlots)	10.50	8.75	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (caselots)	18.00	22.00	19.00
Babbitt metal (best grade)	30.80	41.00	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	10.00	9.25
Copper, light, and bottoms	8.50	8.50	8.25
Lead, heavy	3.75	3.50	3.65
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.00
Brass, light	4.25	4.25	4.75
No. 1 yellow brass turnings	5.00	5.00	5.00
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	12.00	14.50
IC,	112 sheets	12.80	12.30	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

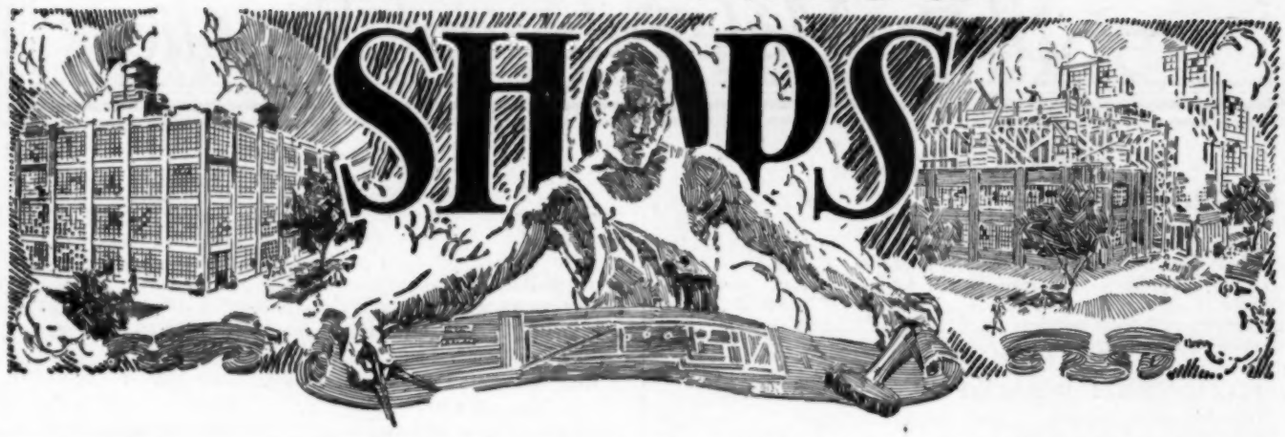
	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.82@.83	1.06	.90
White lead, dry or in oil	100 lb. kegs.	New York,	12.25
Red lead, dry	100 lb. kegs.	New York,	12.25
Red lead, in oil	100 lb. kegs.	New York,	13.75
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton		$3.50
Coke, prompt foundry, Connellsville	per net ton		4.75

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60-5%	60-10%	60-10-10%
1½ and 1¼x3 in. up to 12 in	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	65-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75-10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅝-in., 1x2 in. to 5 in., per 100 lb (net)	$3.35	$3.25	$3.00
Cone heads, ditto (net)	3.45	3.35	3.10
1⅛ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60-5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50-5%	60-10%
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100. Paper	1.32	....	1.49
Cloth	3.02	.....	3.20

NEW and ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Conn., East Hampton—M. H. Hill Brass Co.—one No. 1½ geared bliss straight side double action cam drawing press.

Fla., Orlando—L. D. Wylly—portable conveyor to load sand into cars, equipped with gas engine to run on tracks.

Ga., Rome—The Rome Stove & Range Co., J. M. Berry, Pres.—complete foundry equipment including tumblers, grinding wheels, lathe, cupola, etc.

Ia., Dubuque—The Adams Co., 295 6th St.—one sheet steel brake for 10 gauge.

Ill., Chicago—The Illinois Copper & Iron Mfg. Co. 1830 West Grand Ave.—spinning lathe, 26 in. swing, (used).

Ill., Chicago—The U. & J. Carburetor Co., 510 West Van Buren St.—No. 4 and No. 1 Foster hand screw machines; ¼ in. Gridley automatic screw machine; No. 2 high speed riveting hammer; punch presses equivalent in size to No. 1 Walch up to Loshbaugh Jordan No. 4; engine lathes; heavy duty type single spindle drills; No. 4 Bardons & Oliver turret lathes; Size 0 Brown & Sharpe automatic screw machines; Avery single and multiple spindle drills; heavy and high speed presses; disk grinder; wheel press; small shapers; Leland Gifford four spindle high speed drill presses; Cincinnati milling machines; 16 in. Arbor presses; Rockford single spindle heavy duty press; air compressors.

Ill., Chicago—The Vulcanizing Material Mfg. Co., 1423 West Van Buren St.—one electric knife, ac. 220 volt.

Kan., Hutchinson—E. C. White, 28 East Bigger St.—one Grays sheet metal cutter for 16 gage with deep throat for odd shaped cutting. Could use machine for heavier cutting.

Kan., Waverly—E. Hoffer—machinery for job printing shop.

Ky., Jeff—The Equitable Lumber & Supply Co., L. Picklesimer, Pres.—woodworking machinery, electric pumps, also carload lots of Southern pine lumber for stock.

Ky., Mayville—The Ohio Valley Pulley Wks., Inc., Central Ave., Main and Chester Sts., E. Gardner, Purch. Agt.—round broaches, all sizes, (used), address Box 288.

La., Baton Rouge—The Capital Feed Mfg. Co., P. O. Box 117, L. S. Doherty, Mgr.—feed mixing machinery, hay cutting machinery, coolers and other feed mill equipment.

Mass., Northampton — McCallum Silk Hosiery Co., 377 Dwight St.—new machinery for hosiery mill at Phila., Pa.

Mich., Bay City—The Garber Machine Co., 3004 North Water St., F. Garber, Mgr.—internal cylinder grinder, similar to Whitney, (new or used), also a screw arbor press about 24 in. between jaws, with a capacity of about 20 ton.

Mich., Benton Harbor—Baker-Vawter Co., D. F. Haddord, Purch. Agt.—one 4 roll angle straightener.

Minn., Deerwood—E. Groth—woodworking machinery.

Minn., Minneapolis—The Despatch Mfg. Co., 120 1st Ave., N., electric ovens, A. E. Grapp, Purch. Agt.—punch presses; angle iron shears; high speed power hack saw; serpentine slitting machine.

Minn., Minneapolis — The Minneapolis Crushed Stone Co., 529 Metropolitan Bank Bldg., A. D. Hoar, Pres.—machinery for washing, drying and crushing plant.

Minn., Minneapolis—The Norwegian Lutheran Deaconess Hospital, 2312 15th Ave. S.—power laundry equipment for proposed laundry.

Minn., Minneapolis—The Standard Material Co., Plymouth Bldg., L. L. Quist, Secy.—machinery equipment for washing and screening plant, daily capacity 1,500 ton; probably a pumping plant equipped with modern screens and belt conveyors, drag line, locomotive cranes.

Miss., Gulfport—The Daily Herald, G. L. Money, Purch. Agt.—7 column press.

Mo., Carthage—The Juvenile Shoe Corp.—shoe making machinery for proposed factory on Main St., Pierce City.

Mo., Jefferson City — The Automatic Water Pump Mfg. Co., 236 A East High St., B. A. Divers, Secy. and Asst. Treas.—receiving bids for machine tools, including lathes, drill presses, brass and aluminum furnaces, woodworking machinery, castings, etc.

Mo., Joplin—The Amer. Sign Wks., 117 North Main St., R. Barker, Purch. Agt.—power band saw.

Mo., Joplin—The Forsythe Mfg. Co., 319 East 3rd St., manufacturer of automobile bodies, A. H. Forsythe, Purch. Agt.—lathe.

Mo., Joplin—The Joplin Radio Shop, 422½ Main St., J. Graber, Mgr.—drill press.

Mo., Joplin—The Modern Trunk Factory, 115 West 5th St., E. Weeks, Mgr.—rip saw and planing machinery.

Mo., Joplin—The Moss Rowe Furniture Co., 115 West 9th St., W. L. Moss, Purch. Agt.—woodworking machinery, band saw and lathe.

Mo., Kansas City—The North Mehornay Warehouse, 1019 Charlott St.—band saw.

Mo., St. Louis—F. E. Palmer Supply Co., Ry. Exch. Bldg.—one air compressor.

Neb., Lincoln—The Capitol City Tire Co., 235 South 11th St., A. L. Brown, Purch. Agt.—Weaver tin tools.

Neb., Lincoln—A. E. Gesse, 404 South 11th St.—one 20 in. lathe.

Neb., Lincoln—S. Knisley, 508 North 19th St.—sole stitching machine, prefer a No. 12 Landis or a Champion curved awl machine.

Neb., Lincoln—The Weston Tire Co., 241 South 11th St., P. P. Weston, Purch. Agt.—electric tire mold.

Neb., Lincoln—The Wolff Cycle Co., 1933 O St., motor-cycle repair shop, W. Wolff, Purch. Agt.—small lathe and drill press, electrically driven.

N. J., Gloucester—The Gloucester Sanitary Milk Co.—conveyors and large capacity automatic bottle filling machines.

N. Y., Albany—F. A. West Co., Inc., 5 Main St., D. D. Blewer, Purch. Agt.—printing presses and book binding machinery and equipment.

N. Y., Bath—D. M. White, Savona Rd.—five or 10 gal. capacity ice cream freezing machinery and 6 tubs and cans.

N. Y., Binghamton—Broome County Supervisors, J. R. Jewell, Purch. Agt.—lathe, miller, drill press, compressor and tank for county repair shop.

N. Y., Binghamton—E. T. Gaige, State St.—machine tools for motor repair including internal grinders for cylinders.

N. Y., Binghamton—H. Monroe, 192 Water St.—one motor driven air compressor with tank also a small lathe suitable to mount wire brushes for rubber scarifying, (used).

N. Y., Buffalo—D. Calabuse, 655 Ellicott St.—sheet metal roller and folder, both 30 in., also edging machine and power punch.

N. Y., Buffalo—The Stewart Motor Corp., 93 Dewey Ave.—power punch press or bar cutter, capacity ¾ in. by 5 in.

N. Y., Canandaigua—The Tobin Sash Co. is to change its gasoline power to electrical power and is open for quotations and literature on electric power.

N. Y., Elmira—The Federal Radio Laboratories Inc., C. E. Johnson, 403 West 1st St., Purch. Agt.—machine tools and equipment for the manufacture of small metal electrical parts, also electrical testing equipment.

N. Y., Endicott—The Magic City Ice Co.—ice manufacturing machinery for new plant now in course of construction.

N. Y., Gasport—The Wickwire Limestone Co.—rock handling, crushing, screening and storing machinery and equipment also special equipment for the manufacture of agricultural lime.

N. Y., Gloversville—A. J. Bachman Co., Inc.—four or five 3¼ in. knitting machines.

N. Y., Holland Patent—The Bd. Educ., D. B. Lisle, Purch. Agt.—machine tool equipment for vocational department.

N. Y., Long Island City—The Wappler Electric Co., Harris Ave., A. Verhols, Purch. Agt.—one disc grinder, 18 in.-24 in. disc.

N. Y., Nassau—Prior & Williams—adjustable iron rip saw table.

N. Y., Rochester—W. A. Gengenbach, 29 Strathallen Park—several Cleveland automatics Model A No. 1, spindle drive, ⅜-½ in.-⅝-¾ in.-⅞-1¼ in. (used but must be 95% new).

N. Y., Rochester—The Rochester Y. M. C. A., H. P. Lansdale, Genl. Secy.—machine and woodworking tools, also shop tools and equipment for vocational classes.

N. Y., Smithboro—Ockerman & Withey, B. J. Withey, Purch. Agt.—woodworking tools and equipment.

N. Y., Warsaw—G. Scott—complete small jobbers printing outfit with machinery.

N. Y., Watertown—O. B. Cornwell, 422 East Flower Ave.—one iron adjustable saw table with carrier.

N. Y., Watertown—Kops Bros. Inc., Water St., A. Fried, Purch. Agt.—shafting, hangers and special machinery for the manufacture of corsets (individually motor driven).

N. Y., Waverly—R. Perry—machine tools for motor repairing.

N. C., Asheville—The Biltmore Industries—one 36 in. Goddard Burr picker mixing machine.

N. C., Old Fort—The Old Fort Mills, D. W. Adams, Mgr. and Pres.—machinery for 8,000 spindle yarn mill, (new or used).

N. C., Pinetops—The Pinetops Milling Co., P. O. Box 65, J. H. Saunders, Mgr.—$11,000 to $12,000 worth of roller mill and meal mill machinery, also crude oil engine, (new or used).

O., Akron—H. L. Sutton, 1049 Diagonal Rd.—one 10 x 10 air compressor with tank; two moulding machines; one 10 ton crane, 20 to 30 ft. span; one electric hoist.

O., Cincinnati—The Clifton Pratt Co., 1224 West 8th St., A. E. Clifton, Purch. Agt.—one No. 12½ or 13 Toledo punch press or No. 39 Bliss with 1½ in. stroke.

O., Cincinnati—The Economy Mchy. Co., 428-30 East Pearl St.—J. H. Flynn, Sr., Purch. Agt.—caterpillar tractor shovel with ¾ cu.yd. bucket; complete revolving 9 x 16 in. jaw crusher.

O., Columbus—The Columbus Builders Supply Co., Front and Long Sts., W. F. Kern, Secy.—sand and gravel handling machinery and coal handling equipment.

O., Toledo—J. Myers, 1958 Glendale Ave.—linotype machine for job printing plant.

O., Youngstown—The Bd. Educ., 16 West Wood St.—quantity of various machine tools and equipment for Rayen High School manual training division.

Pa., Brookville—The Bd. Educ., Boro of Corsica and Union Twp., c/o S. C. Beeman, Secy., R. D. No. 4, Brookville—equipment for vocational department and mechanical engineering shops.

Pa., Chester—The Chester Dairy Supply Co., 9th and Hyatt Sts.—equipment for metal working shop.

Pa., Corry—The Corry-Jamestown Mfg. Corp., manufacturer metal furniture—Bliss press and Stiles punching press 4 in., (used).

Pa., Monongahela—The Coshocton Iron Wks., Axleton St.—one 10 ton, one 5 ton and two 2 ton cranes.

Pa., Phila.—The Alva Carpet & Rug Co., Kinsey and Hedge Sts.—looms, throwing frames, twisters, shafting, belting, machine shop equipment, etc.

Pa., Phila.—The Cambria Silk Hosiery Co., A and Cambria Sts., L. Weber, Purch. Agt.—quantity of full fashion automatic hosiery machines, dryers, throwers, twisters, belting, shafting, etc.

Pa., Phila.—The Dept. Pub. Heath, Room 584, City Hall—W. S. Twining, Dir.—one milling machine, geared head high power.

Pa., Phila.—The United Tapestry Mills, Erie Ave. and Amber St.—looms and weaving machinery for new factory.

Pa., Pittsburgh—J. F. Casey Co., Union Arcade—one 5 ton and four 2 ton cranes.

Pa., Pittsburgh—H. J. Heinz Co., 1062 Main St., pickles, preserves, etc.—lathe, drill press, grinder and hack saw.

Pa., Rural Valley—The Advance Newspaper, H. C. Peters, Purch. Agt.—linograph machine.

Pa., Wellsboro—L. B. Marvin—machinery and equipment for proposed planing mill on Tioga St.

S. C., Andrews—The Andrews Mfg. Co.—machinery for the manufacture of slack barrel staves, headings, etc.

S. C., Charleston—The Woodstock Mfg. Co., Center St., J. F. Williams, Pres. and Mgr.—complete line of machinery for the manufacture of fibre cases, containers, etc.

Tenn., Chattanooga — The Davenport Hosiery Mills, 906 Georgia Ave.—hosiery winding machine, Altemus make preferred.

Tex., Beaumont—The Brooks Supply Co., 799 Franklin St.—additional machinery for machine shops.

Tex., Gainesville—C. H. Leonard—printing press and folder.

Tex., San Angelo—C. B. Metcalfe & Son—complete machinery for the manufacture of brooms.

Va., Norfolk—The Atlantic Iron Wks., Water St., F. H. Masi, Pres. and Mgr.—machine shop equipment.

W. Va., Weston—The Independent Publishing Co., R. A. Hall, Purch. Agt.—one 8 x 10 job press and mitering machine.

W. Va., Wheeling—The Construction Dept., 51 16th St.—one vertical electric blue print machine, 220 volts, 60 cycle, a.c. preferably a Pease style J. P.

W. Va., Wheeling—The Wheeling Steel Corp., Wheeling Steel Corp. Bldg.—shapers, milling machines and lathes.

Wis., Cudahy—L. Odry, 1211 Packard Ave.—gas storage tanks and pump.

Wis., Fond-du-Lac—The Hurcum Fuel Co., 35 West 1st St., will open bids about April 10 for machinery, equipment, concrete, etc., for four storage elevators, about 1,000 ton capacity.

Wis., Kenosha—The W. J. Pine Machine Co.—one 30 in. x 8 ft. and one 24 in. x 6 ft. planer; five engine lathes, one 12 in. x 4 ft., two 14 in. x 6 ft., one 16 in. x 6 ft. and one 20 in. x 8 ft.; one 24 in. power feed drill; one drill grinder; one 2 in. hard screw machine; one No. 2 milling machine; one 24 in. shaper and one Universal grinding machine.

Wis., Ladysmith—F. Zachek—blacksmith shop equipment.

Wis., Madison—G. Nelson, 117 West Johnson St.—automobile repair equipment.

Wis., Madison—The Pennsylvania Oil Co., 731 East Washington St.—tanks, pumps, vats, etc.

Wis., Madison—J. Werth, 542 State St.—shoe repair machinery.

Wis., Manitowoc—A. M. Richter Sons Co., South 8th and Madison Sts.—storage tanks, fermenting tanks, generators, presses, etc., for proposed cider vinegar plant.

Wis., Merrill—C. Kuehl—one 30 in. to 32 in. band saw; 4 in. to 6 in. planer; medium size shaper; sander; glue pots.

Wis., Milwaukee—The Blochowiak Dairy Co., 1364 4th Ave.—additional dairy equipment including separators and churns, power driven.

Wis., Milwaukee—J. J. Czaja, 901 Holton St.—ice making and refrigeration machinery.

Wis., Milwaukee—The Delta Mfg. Co., 911 5th St.—small milling machine.

Wis., Milwaukee—J. Hack, 1217 12th St.—one swedging machine for beading purposes.

Wis., Milwaukee—The Milwaukee Forge & Machine Co., 340 Oklahoma Ave., V. F. Braun, Purch. Agt.—trimming press.

Wis., Milwaukee—The Quality Dairy Co., 2347 Hadley St.—special dairy plant equipment.

Wis., Milwaukee—M. Thiel, 680 Russell Ave.—Universal woodworker equipped with motor.

Wis., Sparta—F. J. Domke—drill press, air compressor, jacks, gas storage tank and pump.

Wis., Spooner—The Spooner Milling Co., J. W. Sleight, Purch. Agt.—flour and feed grinding machinery, motor power.

Ont., Allenford—J. Temple—equipment for garage and auto repair shop.

Ont, Guelph—The Gilson Mfg., Ltd., R. Dawson, Purch. Agt.—punch press with capacity of from 45 to 50 ton pressure with approximately a 5 in. stroke.

Ont., London—G. Little of Robinson Little Co., 343 Richmond St.—artificial ice making equipment.

Ont., Montreal—G. Thompson, 2280 St. Hubert St.—small lathe and about $500 worth of tools and equipment for garage and repair shop.

Ont., Parry Sound—C. W. Thompson & Son—equipment for garage and auto repair shop.

Ont., Walkerville—R. H. Cunningham & Co. of Walkerville, has secured a building at 351 Glebe St., London, and will install equipment for the manufacture of electrical furnaces.

Ont., West Lorne—The Seaman Kent Co.—special woodworking machinery for the manufacture of oak and hardwood flooring.

Ont., West Toronto—A. R. Williams Machine Co., 64 Front St.—air compressors and general shop machinery.

Ont., Wiarton—The Kastner Lumber Co.—equipment for saw mills.

Metal Working Shops

Cal., Oakland—S. S. Herrick, foot of Adeline St., has awarded the contract for the construction of a 1 story machine shop on 18th and Campbell Sts. Estimated cost, $5,000.

Cal., Stockton—Cohen & Coiren, 45 South Eldorado St., will build an auto repair shop on North Sutter St. Estimated cost, $6,000.

Conn., East Hartford—(Hartford P. O.)—T. Shannon, Russell St., South Manchester, has awarded the contract for the construction of a 1 story, 80 x 100 ft. garage and service station on Connecticut Blvd. here. Estimated cost, $40,000. Noted March 9.

Conn., Georgetown—Gilbert & Bennett Mfg. Co. has awarded the contract for the construction of a 3 story, 52 x 150 ft. addition to its wire goods factory. Estimated cost, $75,000.

Ia., Des Moines—J. A. Klemm Mfg. Co., 1322 Grand Ave, manufacturers of auto supplies, will soon award the contract for the construction of a 1 story, 66 x 84 ft. factory and garage on Grand Ave. Estimated cost, $10,000. F. A. Harris, 3815 4th St., Archt.

Ill., Chicago—The Dwyer Equipment Co., 9 West Kinzie St., has awarded the contract for the construction of a 1 story, 60 x 125 ft. factory at 4534 North Ave. for the manufacture of ventilating fans. Estimated cost, $15,000.

Ill., Chicago—The Hudson Motor Car Co., 25th St. and Michigan Blvd., has awarded the contract for the construction of a 3 story, 100 x 300 ft. office, sales and service station on 22nd St. and Michigan Blvd. Estimated cost, $350,000. Noted March 2.

Ill., Chicago—R. Johnstone, c/o O. Van Gunten, Archt., 800 North Clark St., has awarded the contract for the construction of a 2 story, 42 x 82 ft. auto repair shop on Clark and Howard Sts. Estimated cost, $20,000.

Ill., Chicago—A. Mikele, 1311 Washburn Ave., has awarded the contract for the construction of a 2 story, 72 x 107 ft. garage on Taylor and Garibaldi Aves. Estimated cost, $50,000. Noted March 2.

Ill., Dixon—E. R. Watts is having plans prepared for the construction of a 1 story, 54 x 150 ft. garage. Estimated cost, $40,000. Private plans.

Ill., Glen Ellyn—O. Smiller, 520 Crescent Blvd., is having plans prepared for the construction of a 2 story, 60 x 150 ft. garage on Crescent St. Estimated cost, $40,000. Private plans.

Ill., Harrisburg—O. O. Cummins Garage & Repair Shop is having plans prepared for the construction of a 1 story, 80 x 160 ft. garage. Estimated cost, $40,000. Private plans.

Mass., Worcester—The Amer. Steel & Wire Co., Grove St., has had plans prepared for the construction of a 1 story, 60 x 100 ft. galvanizing plant. C. E. Goodrich, c/o owner, Engr.

Mo., Jefferson City—The Automatic Water Pump Mfg. Co., 236 East High St., is having plans prepared for the construction of six or seven 1 story factory buildings. Estimated cost, $100,000. B. F. Schuetz, Pres. Private plans.

Mo., St. Louis—The Famous Barr Dry Goods Co., 6th and Olive Sts., plans to build a 6 story garage on 7th and Elm Sts. Estimated cost, $400,000. W. Levy, 625 Locust St., Archt.

Mo., St. Louis—The Johnson Automobile Co., 3667 Olive St., is having plans prepared for the construction of a 2 story, 50 x 52 ft. garage at 3667 Olive St. Estimated cost, $45,000. W. L. Johnson, Pres. W. P. McMahon, Title Guaranty Bldg., Archt.

Mo., St. Louis—The Levering Investment Co., Pierce Bldg., is having plans prepared for the construction of a 3 story, 100 x 150 ft. office, warehouse and shop on 12th and Gratiot Sts. Estimated cost, $150,000. J. R. Whittshore, Pres. P. J. Bradshaw, International Life Bldg., Archt.

Mo., St. Louis—The United Ry., c/o R. Wells, receiver, 39th and Park Sts., has awarded the contract for the construction of a 2 story, 50 x 72 ft. and 1 story, 80 x 208 ft. office, repair shop and warehouse, on Taylor St. and Bway. Estimated cost, $100,000. Noted Oct. 13.

N. J., Camden—Lackey & Hettle, Archts., 5 Hudson St., will soon receive bids for the construction of a 1 story, 150 x 160 x 175 ft. sales and service station on Federal and Newton Sts. for the Studebaker Sales Co., c/o architects. Estimated cost, $65,000.

N. Y., Binghamton—E. T. Gaige, 235 Vestal Ave., has awarded the contract for the construction of a machine shop, repair and storage building on State St. Estimated cost, $40,000.

N. Y., Binghamton—M. and H. Horrowitz have purchased a site on Hawley and Collier Sts., and plan to build a 1 story, 47x75 ft. machine shop and car storage plant. Estimated cost, between $12,000 and $15,000.

N. Y., Waverly—R. Perry plans to build a 2 story machine repair and car storage plant on Elizabeth St. Estimated cost, between $15,000 and $18,000.

O., Cleveland—C. W. Fessenden, 2371 East 4th St., has awarded the contract for the construction of a 1 story, 50 x 141 ft. garage at 2892 East 116th St. Estimated cost, $50,000. Noted March 9.

O., Cleveland—McKinney Steel Co., 802 Perry Payne Bldg., has awarded the contract for the construction of a 1 story sintering plant on Dille Rd. Estimated cost, $75,000.

O., Cleveland—The Parker Electric Co., 1839 Euclid Ave., has awarded the contract for the construction of a 2 story 41x80 ft. office and factory at 4502 Prospect Ave. Estimated cost, $40,000.

Pa., Butler—The Butler Buick Co., Main St., will soon award the contract for the construction of a 3 story, 33 x 110 ft. garage and sales station on Main St. Estimated cost, $150,000. Hunting Davis Co., Century Bldg., Pittsburgh, Archts. Noted Feb. 23.

Pa., Phila.—J. J. Gilman, 1126 Girard Ave., is having plans prepared for the construction of a 2 story 25x178 ft. garage at 2524 North Broad St. Estimated cost, $190,000. J. S. Landes, 200 West Broad St., Soudertown, Pa., Archt.

Pa., Phila.—L. T. Olb, c/o H. T. Saunders, 38 South 16th St., will build a 1 story, 124x151x260 ft. garage on Watts St. and Ridge Ave. Estimated cost, $75,000.

Wis., Cudahy—J. Paulu, Archt., St. Francis, (Milwaukee P. O.), is receiving bids for the construction of a 1 story, 60x120 ft. garage on Packard Ave., for L. Odry, 1211 Packard Ave. Estimated cost, $40,000.

Wis., Madison—G. Nelson, 117 West Johnson St., is receiving bids for the construction of a 1 story, 110x152 ft. garage on Johnson St. Estimated cost, $40,000. A. E. Small, Ellsworth Bldg., Archt.

Wis., Merrill—The Merrill Buick Co. will soon award the contract for the construction of a 1 story, 50x122 ft. garage on Main St. Estimated cost, $40,000. Private plans. Noted March 7.

Ont., Leaside—The Durant Motors of Canada, 1011 Royal Bank Bldg., Toronto, plans to build a 3 story, 80x600 ft. auto factory here. Estimated cost, $400,000. Private plans.

Ont., Parry Sound—C. W. Thompson & Son plan to build garage and auto repair shop to replace the one destroyed by fire. Estimated cost, $28,000.

General Manufacturing

Cal., Benicia—G. W. Hume Co., 311 California St., San Francisco, plans to construct additional cannery buildings to its plant, here.

Cal., Colusan—The California Prune & Apricot Growers Assn., San Antonio St., San Jose, plans to build a 1½ story packing plant on Cooper's 2nd Extension here. Estimated cost, $125,000. Private plans.

Cal., Fresno—The Fresno Macaroni Mfg. Co., 480 1st St., has awarded the contract for the construction of a 1 story macaroni factory on Block 27. Estimated cost, $12,900.

Cal., Sacramento—The California Candy Co., c/o A. W. Norris, contractor, Peoples Bank Bldg., has awarded the contract for the construction of a 3 story, 40 x 160 ft. candy factory on R St. Estimated cost, $60,000.

Conn., Hartford—Buck & Sheldon, Inc., Archts. and Engrs., 60 Prospect St., will soon award the contract for the construction of a 4 story, 80 x 100 ft. and 80 x 400 ft. brush factory on Windsor Ave. for the Fuller Brush Co., Asylum St. Estimated cost, $400,000. Noted Sept. 8.

Conn., New Haven—The Natl. Filter & Cloth Weaving Co., 57 Hope St., Brooklyn, N. Y., is having plans prepared for the construction of a 1 story factory on Dixwell Ave. and Mather St., here. Estimated cost, $50,000. W. O. Tate, Bronxville, N. Y., Archt. and Engr.

Fla., Milldale (Jacksonville P. O.)—The Putnam Lumber Co. plans to build saw mill to replace the one destroyed by fire. Estimated loss, $140,000.

Ill., Chicago—Rechsteiner Embroidery Co., 4743 Bernard Ave., has awarded the contract for the construction of a 2 story, 125 x 125 ft. factory on Argyle and Crawford Sts. Estimated cost, $65,000.

Ill., East St. Louis—The Cain Hurley Lumber Co., 1406 Chemical Bldg., St. Louis, Mo., is having plans prepared for the construction of a 1 and 2 story lumber plant to replace the one destroyed by fire. Estimated cost, $45,000. E. M. Cain, Pres. Private plans.

Ill., East St. Louis—The Highland Ice Cream Co., plans to build a 1 story, 26 x 30-57 x 58-45 x 105 ft. ice cream factory on St. Clair and 20th Sts. Estimated cost, $75,000. Private plans.

Ill., Mattoon—The Mattoon Creamery Co. has awarded the contract for the construction of a 1 story, 50 x 130 ft. dairy and creamery. Estimated cost, $25,000. P. Bertram, Mgr.

Ill., Pinckneyville—The Atlas Powder Co. plans to build a 1 and 2 story powder plant. Estimated cost, $200,000. W. A. Smith, Pinckneyville, Engr.

Mass., East Douglas—The Hayward Woolen Co., North Main St., has awarded the contract for the construction of a 2 story, 48 x 126 ft. and 68 x 150 ft. dye house and picker building. Estimated cost, $100,000.

Mass., Marlboro—The Dennison Mfg. Co., Farmingham, has awarded the contract for the construction of a 4 story, 70 x 300 ft. factory for the manufacture of paper products. Estimated cost, $400,000.

Mich., Detroit—The Eastern Market Sausage Co., 2472 Riopelle St., is having plans prepared for the construction of a 2 story, 26 x 48 x 105 ft. manufacturing plant on Winder St. Estimated cost, $38,000. Hazleton, Clark & Co., 1359 Book Bldg., Archts.

Mich., Detroit—The Mills Baking Co., 5165 4th St., will soon award the contract for the construction of a 3 story, 70 x 140 ft. bakery plant on Merrick Ave. Estimated cost, $40,000. Smith, Hinchman & Grylls, 710 Washington Arcade, Archts. Noted March 2.

Minn., Minneapolis—The Fulton Bag & Cotton Mills, 643 Security Bldg., V. C. Douglas, representative, is having plans prepared for the construction of a 3 story factory and administration building on East Hennepin Ave. and Taft St. Estimated cost, $300,000. Kees & Colburn, 245 Plymouth Bldg., Archts.

Minn., Minneapolis—The Norwegian Lutheran Deaconess Hospital, 2312 15th Ave., S., is having plans prepared for the construction of a 2 story, 45 x 75 ft. power house, laundry and dormitory, on 15th Ave., S. and 24th St. Estimated cost, $45,000. F. Paulson, Supt. Magney & Tusler, 126 South 9th St., Archts.

Minn., St. Paul—The Roe-James Glass Co., 109 East 9th St., has purchased a site on 8th St. near Minnesota St. and plans to build a 4 story, 50 x 190 ft. factory and office. Estimated cost, $150,000. Will probably be built in 1923. Architect not announced.

Mo., Hannibal—The Robinson Bros. Paint Co., 201 South 5th St., has awarded the contract for the construction of a 1 story factory and warehouse. Estimated cost, $40,000. Noted Feb. 23.

Mo., Jefferson City—Ruwart Bros. Mfg. Co., 100 Monroe St., plans to build a 1 and 2 story addition to its saddling factory. Estimated cost, $25,000. Architect not selected.

Mo., Marshall — W. C. Fisher and T. Thorp plan to build a 1 story dairy and ice cream factory. Estimated cost, $25,000. Architect not selected.

Mo., St. Louis—The American Syrup & Preserving Co., Ruskin Ave., is having plans prepared for the construction of a 2 story, 60 x 225 ft. factory and warehouse at 5111 Penrose Ave. Estimated cost, $25,000. E. J. Lawler, 404 Sawyer Bldg., Archt.

Mo., St. Louis—M. Bass & Sons, 5175 Easton Ave., are having plans prepared for the construction of a 1 story, 50 x 125 ft. laundry at 5100 Easton Ave. Estimated cost, $35,000. Private plans.

Mo., Pierce City—The Juvenile Shoe Corp., Carthage, plans to build a shoe factory on Main St. here. Estimated cost, $10,000.

N. J., Blackwood—The Cambria Hosiery Mills, A and Cambria Sts., Phila., will soon receive bids for the construction of a 1 story 45 x 200 ft. hosiery mill here. Estimated cost, $35,000. M. W. Easby, 1804 Chestnut St., Phila., Engr.

N. J., Gloucester—The Gloucester Sanitary Milk Co. is having plans prepared for the construction of a 2 story, 40 x 50 ft. bottling plant. Estimated cost, $25,000. Lackey & Hettle, 5 Hudson St., Camden, Archts.

N. J., Montclair—The Montclair Rink & Ice Co., c/o G. Backhoff, Archt. and Engr., 9 Clinton St., Newark, is having sketches made for the construction of a 1 story, 125 x 250 ft. ice plant and skating rink. Estimated cost, $200,000.

N. Y., Buffalo—The Westinghouse Electric & Mfg. Co., Ellicott Sq., plans to build a 1 story, 125 x 128 ft. factory and warehouse on Milton St. Estimated cost, $17,000.

N. Y., Gasport—The Wickwire Limestone Co. plans to build agricultural lime plant to replace the one which was recently destroyed by fire. Estimated loss, $50,000.

N. Y., Little Falls—The Barnet Leather Co., Inc., 598 East Mill St., plans to build a 3 story addition to its leather manufacturing plant. Estimated cost, $200,000. Address E. L. White, Genl. Mgr.

N. Y., Long Island City—The Ronzonni Macaroni Co., 612 Jackson Ave., plans to build a 5 story addition to its factory on Jackson Ave. Architect not selected.

N. Y., New York—The Gotham Silk Hosiery Co., 516 5th Ave., plans to build a factory on 33rd St. and 1st Ave. Estimated cost, $250,000.

O., Akron—The Brown Graves Co., 65 East Miller Ave., manufacturers of sash doors and interior finishing, plans to build a three story factory on Miller Ave. to replace the one destroyed by fire. Estimated cost, $200,000.

O., Cleveland—The Natl. Carpet Cleaning & Rug Mfg. Co., 1971 West 50th St., has awarded the contract for the construction of a 2 story, 40 x 123 ft. factory on West 50th St. and Lorain Ave. Esitmated cost, $50,000. Noted July 7.

O., Cleveland—The Pearl State Road Market Co., c/o C. Kamp, Pres., Euclid and 46th Sts., is having plans prepared for the construction of a 2 story, 200 x 200 ft. market and commercial building, including a refrigeration plant, on Pearl and State Rds. Estimated cost, $250,000. A. E. Keller, 1298 Carlyon Rd., Archt.

O., Cleveland—The Saginaw Bay Lumber Co., c/o C. H. Prescott, 2106 West 3rd St., has purchased a site on Harvard Ave. and East 42d St., and plans to build a 1 and 2 story lumber yard, consisting of six buildings, mill sheds, office and garage. Estimated cost, $150,000. Private plans.

O. Youngstown—The Ward Baking Co., Southern Blvd. and St. Marys St., New York City, is having plans prepared for the construction of a 4 story, 71 x 168 ft. bakery on Manoning Ave., here. Estimated cost, $150,000. C. B. Comstock, 110 West 40th St., New York City, Archt. and Engr.

Pa., New Cumberland—The New Cumberland Box Co., Bridge and 2nd Sts., is having plans prepared for the construction of a 2 story, 60 x 90 ft. factory on Bridge St. Estimated cost, $50,000.

Pa., Phila.—The Bisler Box Co., 245 North 6th St., is having plans prepared for the construction of a 6 story, 112 x 190 ft. box factory on 10th and Spring Garden Sts. Estimated cost, $250,000. Private plans.

Pa., Phila.—The Cambria Silk Hosiery Co., A and Cambria Sts., has awarded the contract for the construction of a 2 story, 53 x 53 x 119 x 184 ft. hosiery mill on Louden and Mascher Sts.

Pa., Phila.—The Curtis Publishing Co., Independence Sq., has awarded the contract for the construction of a 3 story, 145 x 215 ft printing plant (1st unit), on 7th and Sansom Sts. Noted Feb. 2.

Wis., Eau Claire—E. Peterman, 312 Gibson St., has had plans prepared for the construction of a 1 story, 50 x 105 ft. dry cleaning plant on Chippewa Rd. Estimated cost, $50,000. Private plans.

Wis., Sheboygan—The Sheboygan Gas Co., 618 North 8th St., has awarded the contract for the construction of a 1 story, 42 x 146 ft. gas plant on 8th St. Estimated cost $50,000. Noted March 2.

Wis., Wausau—The Levenhagen Dairy Co., 612 3rd St., has awarded the contract for the construction of a 2 story, 75 x 95 ft. dairy on Washington St. Estimated cost, $45,000.

Wis., Mayville—The Peerless Traveling Goods Co. plans to build a 2 and 3 story, 50 x 90 ft. factory on Main St. for the manufacture of leather goods. Estimated cost, $50,000. Architect not selected.

Ont., Deer Lake—Tudhope & Ludgate, Parry Sound, plans to build a saw mill here. Estimated cost, $25,000.

Que., Hull—The Canadian Automobile Corp., 199 Sparks St., Ottawa, plans to build a rubber tire factory on Lamontagne Park, here. Estimated cost, $50,000. C. A. Fox, 394 Harvard St., Montreal, Archt.

Ont., Toronto — Barber Ellis, Ltd., 71 Wellington St., W., has awarded the contract for the construction of a 3 story, stationery plant on Adelaide St., W. Estimated cost, $150,000.

Ont., Welland—The Empire Cotton Co. plans to build an addition to its factory. Estimated cost, $250,000. Architect not selected.

Que, Wrightville—The Easton Chemical Co., Ltd., 197 Sparks St., Ottawa, Ont., plans to build a factory here. Estimated cost, $10,000. Architect not selected.